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By *JAMES DRAKE*, M. D. late Fellow of the College of Phyſicians and *F. R. S.*

The THIRD EDITION with an Appendix.

VOL. II.

LONDON:
Printed for W. and J. INNYS, at the Weſt End
of St. *Paul*'s. M.DCC.XXVII.

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A NEW SYSTEM OF ANATOMY.

BOOK II.

Of the Parts of the Thorax *or Middle* Venter.

CHAP. I.

Of the MAMMÆ or BREASTS.

Mammæ.

ON the outſide of the *Thorax*, beſides the common containing Parts which have been already ſpoken to, appear the *Breaſts*, one on each ſide. In Women, of conſiderable Eminence and Uſe; in Men, as they are of little Uſe, ſo they make no great Figure: And therefore we ſhall take our Deſcription of theſe Parts from the other Sex.

Time of Augmentation or Decreaſe.

About the time of Puberty or Eruption of the *Menſes* the Breaſts begin to ſwell, and grow prominent, probably from a greater Afflux of Humours at that time, which not only fill the Veſſels, but dilate the Subſtance of them; which

Opinion is confirm'd by their ſhrinking when Age renders them unfit for Procreation, and their *Menſes* deſert them.

Magnitude. Their Magnitude is various and indeterminate, biggeſt in times of Geſtation and Lactation, at which times they ſeem to be more ſpongy and compreſſible; at others plump but firm, eſpecially in Women that have never been pregnant.

Figure. They reſemble in Figure the large Section of a Globe, having in the middle a Prominence terminating in a blunt Point, which is the *Papilla* or *Nipple*; which in Virgins is of a freſh, pale, reddiſh Colour; in thoſe that give ſuck, bluiſh; which in Age turns to a blackiſh. In the Extremity of it are divers Perforations or Holes, to which reach the *Lacteal Tubes.* Papilla.

Areolæ. Round about the Nipple is a pale browniſh Circle, which is call'd the *Areola*, which is likewiſe in different Ages and Circumſtances, of different Colours.

Subſtance. The internal Subſtance of the *Mammæ* is compos'd of Glands intermix'd with Globules, and Veſſels of Fat.

Glands. The Glands are of different Sizes, and, whilſt Vigour laſts, look whitiſh: In Age they turn yellow.

Veſſels. The Breaſts receive Arteries and Veins from the *Subclavian*, which run under the *Sternum* till they come juſt under the *Mammæ*, where they paſs outwards to them. And beſides theſe, they ſend many Branches which inoſculate with other Branches of the Hypogaſtricks. There are likewiſe other Blood-Veſſels, which come to them from the Intercoſtals and Thoracics. All the Veſſels are much larger, and more conſpicuous in thoſe that give ſuck, than in other Women, as is manifeſt even upon external Inſpection.

Nerves. Their Nerves come from the fifth Pair of the *Spine*, and from a *Plexus* about the *Clavicles.* Beſides

ſides which, there are others which have not been diſtinctly traced to their Originals, neither perhaps is it material to trace them.

Lymphæducts. Dr. *Wharton* aſcribes to them a great number of *Lymphæducts*, which upon the Udder of a Cow are very conſpicuous, but are not eaſily traced deep into the Subſtance, tho' 'tis probable they ariſe from thence, and exonerate themſelves into the *Thoracic Duct.*

Tubuli Lactiferi. Of all the Veſſels belonging to this Part, the moſt conſiderable are the peculiar ones, the *Lacteal Pipes* or *Tubes* which ariſe very ſlender, but meeting together form divers Trunks, which end in the *Papillæ* or *Nipples.* Theſe *Tubes* are not every where of equal Capacity, but being in ſome places more, in ſome leſs dilated, form a ſort of *Cells*, which ſeem contriv'd to hinder the ſpontaneous Efflux, and to create a Neceſſity of ſucking to fetch it out; which notwithſtanding is not always neceſſary, for the Milk will frequently run of it ſelf out of a full Breaſt that has been much ſuck'd. Beſides this Contrivance, Nature has fram'd *Anaſtomoſes*, or Communications between theſe Ducts, to obviate the Inconvenience that might ariſe from any caſual Obſtruction of one or more of them.

Glandulæ & Fibræ Papillares. Of the Concurrence of theſe *Tubuli*, or *Pipes*, is the Subſtance of the *Papilla* in great meaſure form'd, amongſt which is interſpers'd a glandulous Subſtance, which ſerves to keep them from compreſſing each other, and with it are intermix'd abundance of Fibres drawn from the external *Teguments* of the *Papillæ*, by means of which the *Lacteal Tubes* are conſtring'd, and the motion of the Milk is modify'd.

Some have imagin'd particular Ducts from the *Thoracic* to the *Mammæ*, but in my Opinion without any Occaſion, and 'tis probable that theſe

Ducts never had any Exiſtence, but in the Imagination of fanciful Men.

Ductus Adipoſi. Beſides theſe Veſſels there are abundance of *Fatty Globules*, which ſome would have only to ſerve to fill up the *Interſtices* of the Glands, and to keep them moiſt: But I muſt needs agree with *Malpighius* that they have a much nobler Uſe.

Their Uſe. In all Milk the Butter and Oil of it is a great part, and indeed Milk ſeems to be nothing elſe but Water and Oil united by the Artifice of Nature, perhaps by the Intervention of peculiar Salts, which Milk it ſelf, however ſweet at firſt, does after a little ſtanding diſcover to be plentifully in it; and we find that by the Mediation of Salt, Water and Oil may be ſo mixed, as very much to reſemble Milk, tho' we cannot come up to the Mechaniſm and make it.

CHAP. II.

Of the Diaphragm.

Diaphragm. THE DIAPHRAGM, which divides the *Abdomen* from the *Thorax*, is a Muſcle of great Importance, upon the Score of its uſe in Reſpiration.

Situation. It is ſituated obliquely, being on the fore-part connected to the *Sternum* and *Ribs*, and on the hinder to the *Vertebræ* of the Loins, which renders its Poſition ſomething ſlanting

Figure. Its Figure is almoſt circular, varying only ſo much from it, as the Figure of the Cavity of the Body in that part, and its two Proceſſes, which it ſends to the *Vertebræ* of the Loins unavoidably occaſion it to do.

Muſcles. It conſiſts of two Muſcles, (or as ſome will have it, of three, and perhaps not miſtakenly.)

The foremoſt of the two is thin and broad, extended from the *Sternum* on each ſide to the ſpurious Ribs and *Vertebræ*.

The hinder is thick, and has a very fleſhy Belly: It ariſes from the *Vertebræ* of the Back by two Proceſſes, which give room for the Diviſion of it into two Muſcles. The Right, which is the longeſt, , ſprings with a triple Tendon from the two or three firſt *Vertebræ* of the Loins, and the laſt of the Back. The Left, which is ſhorter, and ſometimes ſimple, ſometimes double, ariſes from the laſt of the Back and the firſt of the Loins, and ſometimes from one only of them. Theſe Originations, when nearly inſpected, appear to be tendinous. The Tails of theſe Muſcles end in a tendinous *Centre*, which is perforated towards the right ſide for the *Vena Cava*; towards the left backwards, its fleſhy part gives way to the *Gula*: The deſcending Trunk of the great Artery, *Ductus Thoracicus*, and *Vena Azygos*, paſs between its two inferior Proceſſes.

single

Veins. The Veins of the *Diaphragm* are pretty large, and go directly to the *Cava*, between its entrance into the *Thorax* and the *Liver*, where two pretty large Branches from each ſide of the *Diaphragm* enter it.

Arteries. It has Arteries immediately from the *Aorta*, and ſometimes from the *Cœliack*, and a few ſmall Twigs from the *Lumbals* and *Adipoſe*.

Verheyen mentions two Arteries and two Veins of his own Diſcovery, whereof the right Artery and the two Veins are Branches of the *Subclavians*. The left he dares not pretend to have ſufficiently trac'd, but ſays, that in the *Diaphragm* the Arteries and Veins inoſculate with the aforemention'd of their kind, and that the Veins receive ſome Branches in their return from the *Diaphragm*, from the *Pericardium* and *Mediaſtinum*.

Nerves. It receives a pretty large Nerve from the *Plexus Cervicalis* on each ſide, and from the ſecond Pair of the *Vertebræ*, which from a triple Root form a conſiderable Branch, which diſtributes it ſelf on each ſide through the whole Body of the *Diaphragm.*

Motion. In Inſpiration, the *Diaphragm* deſcends towards the *Abdomen*, which is its proper Motion, which as a Muſcle is Contraction. In Exſpiration it is relaxed, and with the *Coſtæ* drawn upwards, and makes a Concave-Convex Figure; the Concave ſide towards the *Abdomen.* By this alternation of Poſture, it enlarges the Cavity of the *Thorax* in Inſpiration, of the *Abdomen* in Exſpiration. By this reciprocal alternative Motion, it ſerves as well to draw down the Ribs, and enlarge the *Thorax*, as to compreſs the *Abdomen*, and that way to aſſiſt to the Expulſion of the Contents of the Stomach and Inteſtines, and to the Excluſion of the *Fœtus* in Parturition.

CHAP. III.

Of the PLEURA *and* MEDIASTINUM.

Pleura. THE PLEURA is a ſmooth Membrane, lining the whole inſide of the *Thorax*, and conſiſts of a double Membrane, between the Duplicature of which paſs the *Vena Azygos*, and the Intercoſtal Arteries and Nerves.

It has Arteries and Veins from the *Intercoſtals*, *Mammaries*, and *Diaphragmaticks*, and Nerves from the *Intercoſtals.*

Uſe. It ſerves to line the inſide of the *Thorax*, and render it ſmooth, that the Lungs may not be hurt in their Motion.

Mediaſtinum. Out of a Duplicature of this is form'd the *Mediaſtinum*, which divides the *Thorax* longitudinally,

nally, including betwixt its two *Lamellæ* the Heart, and affording Paſſage to the *Oeſophagus*, *Vena Cava*, and *Stomachic Nerves.*

Veſſels. It has Arteries and Veins from the *Mammaries* and ſuperior *Diaphragmaticks*, and ſome Branches immediately from the great Arteries and Vein, which have been call'd the *Mediaſtinæ* as proper to it.

Nerves. Its Nerves come from the *Stomachics* and *Diaphragmaticks*, which in their Paſſage through it beſtow ſome Branches upon it.

Lymphæducts. It has *Lymphaticks* which tend to the *Thoracick* Duct. But of this more when we ſpeak of the *Pericardium*.

CHAP. IV.

Of the THYMUS.

Thymus. THE THYMUS is a Conglomerate Gland, ſituate in the upper part of the *Thorax* juſt below the Diviſion of the *Subclavian* Arteries and Veins in a *Fœtus*, and in Children new born, large, ſoft and white, abundantly bigger than in Adults.

Veſſels. It has Arteries and Veins from the *Carotids* and *Jugulars*, and Nerves from the *Par Vagum.* Over the Surface of it run divers *Lymphaticks*, but whether they come from the Interior Subſtance of it, is not quite ſo plain in Fact, as it is from Reaſon credible.

It is often found with a Milky Juice in new-born Children; its *Lymphæducts* have no *Valves* in them; for by injecting a Liquid into the *Ductus Thoracicus*, it will paſs into the *Lymphæducts* of the *Thymus*; the like has been obſerv'd by injecting Wax. The *Thymus* has been therefore thought to be a kind of *Diverticulum* to the *Chyle* in the *Thoracick Duct* when over-charg'd, as well as to receive the *Lympha* from the adjacent Parts, in order to tranſmit it to the *Thoracick Duct*. The ſpace it takes up in the Cavity of the *Thorax* of a *Fœtus* muſt be very much crouded when the Lungs become diſtended by Reſpiration; whence it is the neighbouring *Lymphatick* Glands (as thoſe about the *Subclavian*, and the internal *Jugular* Veins) are larger in the Adult when the *Thymus* is leſs; and *vice verſa* leſs in the *Fœtus* (in proportion) when the *Thymus* is largeſt.

CHAP. V.

Of the HEART *and* PERICARDIUM.

Heart. THE HEART *is a Muſcle ſituated in the middle of the* Thorax, *into which the two great Veins*, (*viz.* Cava *and* Pulmonaris) *diſcharge themſelves by the Mediation of its Auricles, and from whence the* Aorta *and* Pulmonary Arteries *ariſe, and by its reciprocal Action of Conſtriction and Dilatation is the main Inſtrument of the Circulation of the Blood, and the Foundation of all Vital Action.*

Capſula. It is included in a *Capſula* or *Pouch* which conſiſts of a double Membrane, the Inner ariſing from the Tunicks of the Veſſels of the Heart, and the Outer from the *Mediaſtinum*.

Figure. Its Figure is like that of the Heart which is *Conoid*, and it embraces the Heart laxly, allowing room for its *Pulſation*.

Connexion. In Human Bodies, and in them only, it is connected below, to the *Tendinous* part, or *Centre* of the *Diaphragm*, whereas in Brutes it is looſe.

Externally it adheres to the *Mediaſtinum*, and in the ſuperior part to the Veins and Arteries of the Heart, for the paſſage of which it has ſeveral Perforations.

Veſſels.

It receives Arteries and Veins from the *Mediaſtins*, and from the ſuperior *Diaphragmaticks*, in the upper part, and in the lower from the *Phrenick.* Its Nerves come from the neighbouring Branches of the *Par Vagum.* And it has likewiſe ſome *Lymphaticks* which empty themſelves into the *Thoracic Duct.*

Uſe.

Its Uſe is ſuppos'd to be the defence of the Heart, as likewiſe to contain a ſoft ſerous Humour, which may ſerve to lubricate and moiſten the Heart.

This latter Opinion has been ſomewhat controverted of late by ſome who think that this Water is not naturally there, but that it is ſeparated forcibly during thoſe Convulſive Agonies which uſually ſupervene in *Articulo Mortis.*

This Opinion is grounded on the Difficulty that Anatomiſts have met with in tracing its paſſage: For it does not yet plainly appear which way it comes, nor how it is carried off: And it is hard to imagine that the quantity always remains the ſame, or that it could do ſo without Putrefaction: Yet the Paſſages through which it ſhould be ſhifted, not being yet demonſtratively diſcover'd, I muſt be contented to leave it, as I find it, *ſub judice Litem.*

Whence ſeparated doubtful.

The Doubt has been as great likewiſe whence this Humour was ſeparated. The moſt recent Opinion, and the moſt probable is, that it is ſecreted by ſome Glands about the Baſis of the Heart. However it ſeems to me to be neceſſary by its Lubrication to prevent any Inflammation that might probably ariſe from the dry Friction of the Heart and its *Capſula.* But theſe things are deliver'd not dogmatically but Problematically, and left to future Inquiry.

Figure of the Heart. Tab. xi. A. B. C.

The Figure of the Heart it ſelf is that of a Cone or Pyramid revers'd; The upper and broader part of which is call'd the Baſis, and the lower the Cone or Point.

Magnitude. Its Magnitude is indeterminate, and differing in ſeveral Subjects according to their reſpective Dimenſions. However its ordinary length is about ſix Inches, and its Breadth at the Baſis betwixt four and five, and the whole Circumference about fourteen.

Situation. It is ſituated about the middle of the *Thorax*, between the two Lobes of the Lungs; and is faſtned to the *Mediaſtinum* and *Pericardium*, and ſupported by the great Blood-Veſſels to which alone it is immediately connected, being for the convenience of its Motion diſingaged from any other Impediments.

Membrane. ib. a. a. It is cover'd with a thin Membrane, which about the Baſis is guarded with Fat.

Ventricles. App. Tab. i. Fig iii. E. F. It has two great Cavities or Ventricles of Capacities ſomewhat unequal: The right being of the two, larger, and capable of containing between two and three Ounces of Blood, the left not containing ſo much by about half an Ounce.

Septum. ib. G. The *Ventricles* are divided by a thick fleſhy Partition, conſiſting of the ſame Muſcular Fibres that the *Parietes* of it do, and is call'd the *Septum*, the Figure of which is Concave towards the left Ventricle, and Convex towards the right. Between theſe Ventricles there is no immediate Communication. But the Blood circulates thro' the Lungs to arrive at one Ventricle from the other.

Parietes. App. Tab. i. Fig. iii. The *Parietes*, or Sides of theſe Ventricles, are of a thickneſs and ſtrength very unequal; the left being much thicker than the right, becauſe of its Office, which is to force the Blood through all parts of the Body; whereas the right drives it through the Lungs only, and is therein greatly aſſiſted otherwiſe, as ſhall in proper place be ſhewn.

In

Columnæ Carneæ. ib. Fig. i.

In theſe Ventricles are divers ſmall Muſcles deriv'd, and as it were detach'd from the *Parietes* of the Ventricles, and connected by *Tendinous* Extremities to the *Valves* of the Heart, and are by Authors diverſly call'd *Columnæ Carneæ*, *Lacertuli*, &c. and theſe little *Muſcles* or *Columnæ Carneæ*, being faſtned to the *Parietes* of the Heart on one ſide, and the *Tricuſpid* and *Mitral Valves* on the other, do by their Contraction in the *Syſtole* of the Heart draw out the *Valves*, and by that means not only ſhut up the Orifices of the Veins, but, as the Ingenious Mr. *Cowper* obſerves, *More exactly cloſe the Ventricles in their* Syſtole, *than they could have been, had they been ſmooth.*

Auricles. Tab. xi. b. c c.

Theſe *Ventricles* are capp'd or cover'd each with an *Auricle:* Theſe *Auricles* are two Muſcles conſiſting of a double order of fleſhy Fibres, as the Ventricles of the Heart themſelves do, whoſe Proportion they ſeem exactly to follow, both as to Strength and Capacity, and in the Tendons of which they terminate. Theſe *Auricles* are mov'd regularly after the manner of the Heart, the order only revers'd, that is, they are contracted whilſt the Heart is dilated, and dilated whilſt the Heart is contracted.

Veſſels common ib. D.H.I.

Theſe Veſſels which proceed from, and terminate in the Heart, and its Auricles are two Arteries, the *Aorta* and the *Pulmonary Artery*, which have their Origination from the Ventricles of the Heart: The *Aorta* from the left, and the *Pulmonary* from the right: And two Veins which terminate in the Auricles of the *Cava*, or great Vein in the right; and the *Pulmonary* Vein in the left.

Valves. App. Tab. ii. Fig. iii, iv, v, vi. *Semilunar.*

At the reſpective Orifices of theſe Veſſels are placed *Valves*. At the Orifice of the Arteries, within each Artery are fixed three *Semilunar Valves*, that is, three Membranes of a *Semilunar*

Figure, which being expanded cloſe the Orifice of the Artery, and hinder the Relapſe of the Blood into the Heart at the time of its Dilatation. At the Mouth of the right Ventricle of the Heart, juſt at its Juncture with the Auricle, are placed three other *Valves* call'd *Tricuſpides* from their having three Points, which are faſtned by tendinous Fibres to the *Columnæ Carneæ* beforemention'd, and upon the Contraction or *Syſtole* of the Heart cloſe the Orifice of it, and hinder the Blood from recurring into the great Vein.

Tricuſpid App. Tab. i. Fig. i.

The ſame Office the *Valvulæ Mitrales* (which are in number but two, and ſo call'd from their reſemblance of a Mitre) do at the *Exit* of the Left Ventricle, ſtopping the return of the Blood into the *Pulmonary* Vein.

Mitral. ib.

Subſtance.

The Subſtance of the Heart it ſelf is intirely Fleſhy or Tendinous, conſiſting of a continued Series of *Muſcular Fibres* variouſly contorted or wound up, and ending at the Orifices of the reſpective Ventricles, and there forming the Tendons, by which means they make the Heart a double Muſcle, or as ſome think two Muſcles.

Strait Fibres. ib. Fig. v.

As ſoon as the proper Membrane is taken off, there appear, on the outward Surface on the right Ventricle, ſome ſlender ſtrait Fibres tending to, and ending in the *Baſis.*

Spiral Exterior Order. Fig. xi.

Immediately under theſe lyes a double order of *Spiral Fibres.* The Exterior Order of theſe aſcend obliquely from the *Septum Cordis* to the *Baſis*, forming thereby a ſort of *Helix* or *Cochlea.*

Interior.

The Interior Order takes a Courſe juſt contrary to thoſe which they lye under, and ſpringing from the right ſide, wind obliquely towards the left, incompaſſing both *Ventricles*, and ending in the *Baſis* on the left ſide, and forming a *Helix* of an Inverſe Order.

Theſe Fibres are beſt diſcern'd in the unravelling a Sheep's or Ox's Heart after they have been well boyl'd. In which as ſoon as the Membrane of the Heart is taken off, the firſt Order readily appears, the Fibres of which do not all of them reach from the *Baſis* to the *Cone*, but ſome of them taking a much ſhorter turn, as ſoon as they have meaſur'd about half the Circumference of the Heart, turning about with a kind of an Arch, go with an oblique Courſe to the Tendon of the other ſide and Ventricle. *Method of diſcovering the Fibres.*

After theſe Fibres are remov'd, thoſe of the left Ventricle appear, among which are no ſtrait ones, but firſt appears a Series of Fibres running ſpirally to the left, under which, as in the right Ventricle, lye another Order running juſt the contrary way. Theſe Fibres do not, within the right Ventricle, extend only to the outward *Paries* but encompaſſing the whole Ventricle, make the *Septum* appertain peculiarly to, and be a part of the left Ventricle. Many of theſe Fibres, inſtead of terminating as the reſt do in the Tendons of the *Heart*, run inwards and form the *Columnæ Carneæ*, of which we have ſpoken before. Others reaching down to the *Cone* are wound about it, and form that Circle which is call'd the *Centre*.

The Structure of the Auricles is ſo like that of the Heart it ſelf, that it needs no particular Deſcription.

The Heart has its proper Blood-Veſſels, Two Arteries ſpringing from the Entrance of the *Aorta*, and one larger Vein with one or two leſſer, all which from their encompaſſing the Heart are call'd *Coronariæ*. *Veſſels proper.* Tab xi. a a.

The Nerves of the *Heart* and its Auricles, come from a *Plexus* of the *Par Vagum*, ſituated in the *Thorax* a little above the *Heart*, and call'd by *Willis*, *Plexus Cardiacus*. *Nerves.*

Lymphaticks. It has ſome *Lymphæducts* which carry the *Lymph* from the *Heart* to the *Thoracic Duct.*

Motion. The uſe of the *Heart* and its *Auricles* is to circulate the Blood through the whole Body, and their Motion is alternate, or oppoſite to each other, the Auricles being dilated to receive the refluent Blood whilſt the Heart is contracted, and contracted whilſt the *Heart* is dilated to drive the Blood into it.

By means of the right Ventricle the Blood is driven through the *Pulmonary* Artery into the Lungs, and by the *Pulmonary* Vein is return'd again to the left Ventricle, from whence thro' the *Arteria Aorta* is diſtributed all over the reſt of the Body, and thence return'd again to the right Ventricle by the *Vena Cava*, ſo making an entire Circulation through the whole Body. This through the *Aorta* and *Cava* being a longer Circuit than that through the Lungs, a greater force is neceſſary to perform it, and therefore the *Parietes* of the laſt Ventricle are by Nature made much ſtronger than that of the Right.

Of the *Foramen Ovale* and *Canalis Arterioſus* in a *Fœtus*, we have taken ſufficient notice before.

T A B. XI.

THE forepart of the Heart and Lungs, with their large Veſſels, clear'd of the *Pericardium*.

A, The Heart in its natural Poſition with its *Cone* inclining to the left ſide.

B, Its *Baſis*.

C, Its *Cone*.

a a, The Fat about its *Baſis*, with the *Coronary* Arteries and Veins running through it before they are diſtributed to the Subſtance of the Heart.

b, The External Surface of the right Auricle.

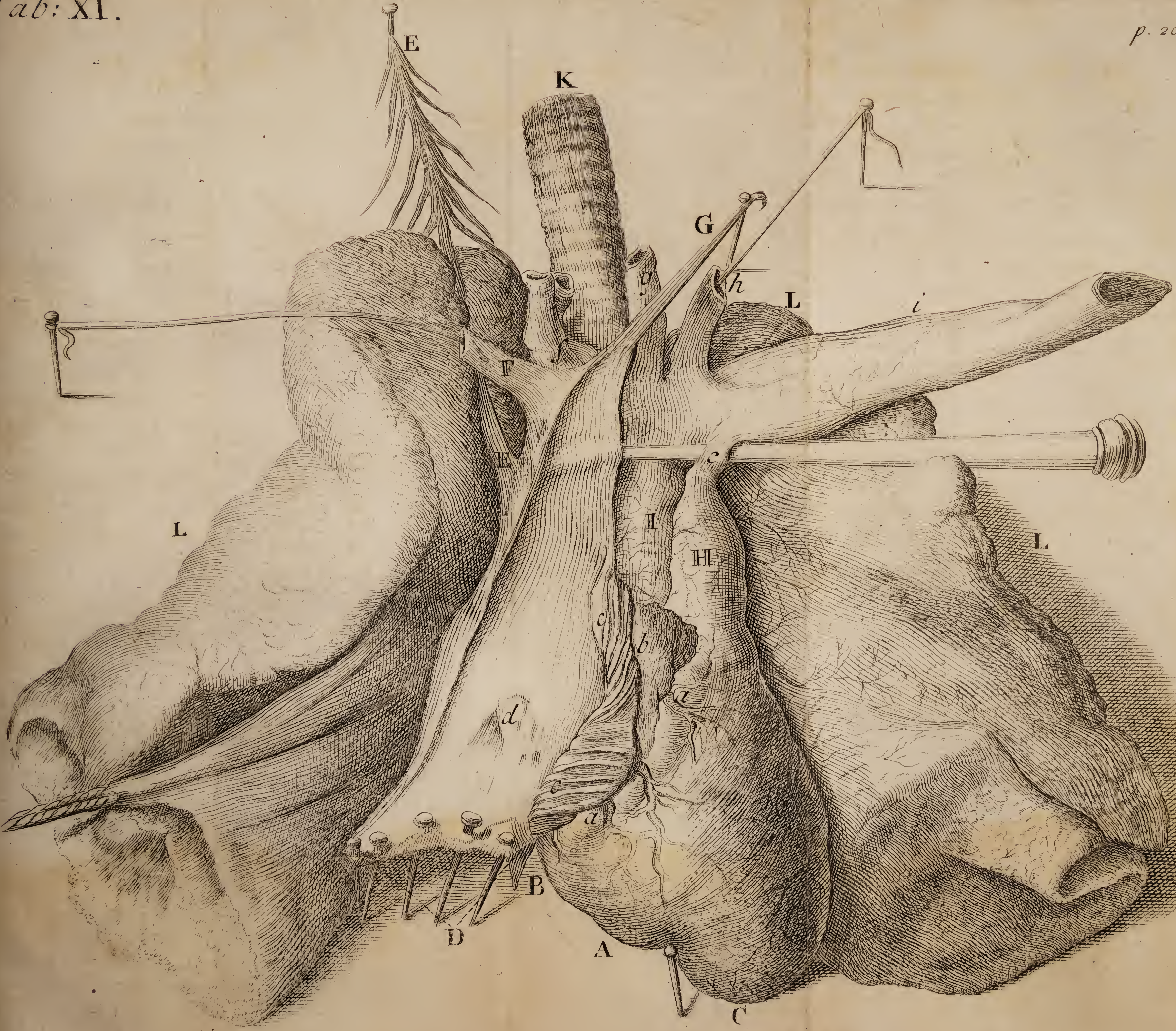
c c, The Internal Surface turn'd out to ſhew its *Carnous* Fibres.

D, The Trunk of the *Vena Cava* cut off immediately above the *Diaphragm*, ſlit open and expanded, in which may be ſeen,

d, The *Foramen Ovale*, here cloſed.

E E, The Trunk of the *Vena Azygos* emptying it ſelf into

Tab: XI.



into the Superior or Deſcending Trunk of the *Cava*.

F, The *Right Subclavian* Trunk pinn'd out.

G, Part of the Left alſo pinn'd out.

H, The Trunk of that *Arteria Pulmonaris* as it ariſes out of the Right Ventricle of the Heart.

e, The *Canalis Arterioſus* converted into a Ligament between the *Pulmonary Artery* and Deſcending Trunk of the *Arteria Magna*.

I, The Trunk of the *Arteria Magna* ariſing out of the Left Ventricle of the Heart.

f, Its firſt long Trunk which is ſoon divided into Two (as here expreſs'd) of which one makes the Right *Carotid*, the other the *Axillary* of the ſame ſide, both cut off in this Figure.

g, The Trunk of the *Left Carotid Artery*.

h, The *Left Axillary* Trunk alſo cut off.

i, The Deſcending Trunk of the *Arteria Magna*, freed from the back parts of the *Left Bronchia*, and from between the hinder parts of the *Lobes* of the Lungs, here drawn out and extended.

K, The Wind-pipe cut immediately below the *Annular Cartilage*.

L, The Right and Left *Lobes* of the Lungs; thoſe of the Right ſide being drawn out to ſhew the Trunk of the *Vena Cava*.

CHAP. VI.

Of the ASPERA ARTERIA *and* LUNGS.

Aſpera Arteria. Tab. xi. K.

THE ASPERA ARTERIA or TRACHEA is a fiſtulous Tube compos'd of *Cartilages* and *Membranes*, deſcending from the *Fauces* into the Lungs, and diſtributed by infinite Ramifications through the Subſtance of them.

It runs along the fore-part of the *Oeſophagus* as far as the fourth *Vertebra* of the *Thorax*, where it is divided into two principal Branches which are beſtow'd on the *Lobes* of the Lungs on each ſide, and theſe again are innumerably ramify'd, ſending a ſmall Twig to every Veſicle of which the Subſtance of the Lungs is compos'd.

Larynx.

The upper part or Head of it is compos'd of five *Cartilages* of different Figures and Names.

Cartilago Thyroides. App. Tab. viii. Fig x.

The biggeſt of theſe is that which guards the fore-part of it, and from the Form of a Shield, which fanciful Men reſemble it to, has been call'd *Thyroides* and *Scutiformis*. It is of a Concave-Convex ſquare Figure, the hollow part being inward and the Gibous outward, having a little Prominence in the middle call'd *Pomum Adami*. It has four *Proceſſes*, at each corner one, of which the two upper are the longer, and tye it by means of a Nervous Ligament to the under part of the *Os Hyoides* on each ſide: The lower and ſhorter connect is to the ſecond *Cartilage*, which is call'd

Cricoides. ibid. Fig. xi.

Cricoides or *Annularis* from its Figure, which is like that of a *Turkiſh* Ring. The fore-part of this is very narrow coming under the former *Cartilage*, but behind it is broad, thick and ſtrong, and is as it were the *Baſis* of all the other.

Arytænoides. App. Tab. viii. Fig. xii.

The third and fourth are call'd *Arytænoides* or *Guttales*, from the Figure of an Ewer which theſe two *Cartilages* joyning together ſomewhat reſemble. At the Juncture of theſe two on the upper part of the *Larynx*, is a Chink bearing the Form of a little Tongue, and therefore call'd *Glottis* or *Lingula*. Through this Chink the Air deſcends into the Lungs, and the Pituitous Matter which is ejected by Coughing in *Catarrhs* is let out.

Epiglottis Ib. b.

Over this Chink lies a fifth *Cartilage* call'd the *Epiglottis*, which is a thin ſoft *Cartilage*, and in Non-Adults almoſt Membranous, of a Figure near Triangular, Concave on the under ſide, and Convex on the upper. Its *Baſis* is faſtned to the *Thyroide* Cartilage, and its Point looſe, that it may open and ſhut with the more eaſe. This *Cartilage* defends the entrance of the *Trachea*, and hinders the Liquids which in drinking ſlip over it into the *Oeſophagus* from falling into the *Trachea*; on the Gibbous Part or Back of the

Epiglottis,

Glands of the Epiglottis.

Epiglottis, lies a little Caruncle, or rather Gland, cover'd with Fat. The Concave Part of it is beſet with divers ſmall Glands, which ſerve to moiſten it, and perhaps the *Trachea* likewiſe.

Glands.

Near the *Larynx* are ſituated four pretty large Glands; two of which, call'd the *Amygdalæ*, ſhall be accounted for among the Glands of the Mouth; the other two lie at the ſides of the lower Cartilage of the *Larynx*, and are call'd *Glandulæ Thyroideæ*, which have no Excretory Duct (as yet diſcover'd) belonging to them, but are look'd on to be of the ſame kind with the *Thymus*, and diſcharge their *Lymphæ* into the Thoracick Duct.

Glandulæ Thyroideæ.

Muſcles Common and Proper.

Theſe Cartilages of the *Larynx* are mov'd by ſeven pair of Muſcles, two pair of which are call'd *Common*, the other five *Proper*. The *Proper* Muſcles are thoſe which have both Origination and Inſertion into the *Larynx*; the *Common*, which have only their Inſertion there.

External and Internal.

Verheyen, not ſatisfy'd with this Diviſion, as juſt and inſtructive, divides them into External and Internal; of which the External are the ſame with the Common, being ſituated upon, and on the outſide of the reſt, which he calls *Internal*, and are the ſame with the *Proper* in the vulgar Diviſion.

Theſe Muſcles have compounded *Greek* Names, which intimates both their Origination and Inſertion.

Sternothyroides. App. Tab. viii. Fig. xvi.

The firſt common or external Pair is call'd *Sternothyroides*, having its Head in the *Os Sternum* or *Breaſt-Bone*, and its Tail in the *Thyroide Cartilage*, and ſerves to draw down that *Cartilage*.

App. Tab. viii. Hyothyroides Fig. xvi.

The ſecond Pair is Antagoniſt to the former. Its Head is on the *Os Hyoides*, and Tail on the *Thyroide Cartilage*, ſerving to lift up that *Cartilage*, and is call'd *Hyothyroides*.

Cricothyroides. ib. d.

The firſt internal Pair riſes from the *Annular Cartilage*, and aſcending obliquely on the hinder part, is inſerted into the ſide of the *Thyroide*, and is call'd *Cricothyroides.* This Muſcle dilates the *Scutiform Cartilage.*

Cricoarytænoides Poſticum. ib. xiii.

The ſecond internal Pair ariſes from the back-part of the *Annular Cartilage*, and terminates in the *Arytænoide Cartilage*, and by its Action it draws back that *Cartilage*, and opens the *Rima*, and is call'd *Cricoarytænoides Poſticum.*

Arytænoides. ib. c c.

The third Pair has its Head in one *Artænoide Cartilage*, and its Tail in the other, and ſerves to bring them together and ſhut the *Rima*, and is call'd ſimply *Arytænoides.*

Cricoarytænoides Laterale. ib. xiv.

The fourth Pair ariſes from the ſide of the *Annular Cartilage*, and is inſerted on the lower part of the *Arytænoides* of the ſame ſide; it ſerves to open the *Rima*, and is call'd *Cricoarytænoides Laterale.*

Thyrioarytænoides.

The fifth and laſt Pair is the *Thyreoarytænoides*, ſituate under the *Cartilago Thyeoides*; from the fore and back part of which it proceeds with a very broad Head, and ends in the *Arytænoides*, which it conſtringes, and ſhuts the *Larynx.*

Trunk of the Trachea. Tab.xi.K

Its Cartilages.

Muſcular Membrane.

The Trunk of the *Aſpera Arteria*, which is continued from the *Larynx*, conſiſts of *Cartilages* making an imperfect Circle, clos'd on the hinder part by a Membrane, leſt the Stiffneſs and Reſiſtance of the *Cartilages* preſſing upon the *Oeſophagus* might hinder Deglutition. Theſe *Cartilages* are from the *Annularis* to the Diviſion in number about twenty, joyn'd together on the back part by a ſtrong fleſhy Membrane, which upon the *Cartilages* themſelves is more tendinous, and in that part not continuous, but interrupted by the Interpoſition of the *Cartilages* themſelves. It conſiſts of tranſverſe Fibres approaching a circular Figure.

Inner Tunic.

The inſide of the *Trachea* is lin'd with a Membrane, which is continued down to its ſmalleſt Ramifications. This is thinner than the former, and conſiſts of longitudinal Fibres, interſecting thoſe of the other at right Angles. Theſe Fibres do not all of them reach the whole length of the Air-pipe, but ſome of them terminate ſhort in the intermediate *Cartilages*, others ariſe from them, and are continued downwards. This *Tunic* is thought to be acutely ſenſile, and to be the occaſion, that the leaſt crumb of any *Solid*, or drop of *Fluid*, ſlipping into the *Trachea*, raiſes a kind of convulſive Cough.

Verheyen*'s Opinion.*

Verheyen thinks that this *Tunic* is cloath'd with another true nervous Membrane, to which he chooſes to aſcribe this acute Senſe; but he gives neither Figure nor Deſcription of it.

Tunicks according to Willis.

Between the two *Tunicks* lie a multitude of ſmall Veſſels, and very minute Glands, to each of which *Willis* allows a particular Membrane, calling one the glandulous, the other the vaſculous Coat.

Exterior Membrane.

Beſides theſe, it has another outward looſe Coat, which is diviſible into ſeveral *Lamellæ*, and abounds with Blood-Veſſels. By means of this Coat it is connected to the *Oeſophagus*, and other adjacent parts.

Verheyen*'s Bronchial Glands.*

Verheyen has diſcover'd another ſort of Glands, found generally about the *Bronchia* or Diviſions of the *Aſpera Arteria*, eſpecially about the larger Branches of it, to which they adhere cloſely in pretty good Number, tho' he has found them ſometimes at ſome diſtance from them, with a large Branch of the pulmonary Artery between them, and of theſe he has obſerv'd ſo many, that he doubts whether there be any conſiderable Ramifications of the *Bronchia* without them; and he has, as he ſays, counted an hundred or more in one Subject.

Their Magnitude. Theſe Glands, he ſays, differ in Magnitude: Thoſe that lie neareſt to the firſt and great diviſions, being the largeſt, exceeding ſometimes in bulk a Hazel-Nut. And tho' he has ſometimes obſerv'd thoſe which adhere to the lower Branches to be bigger than thoſe above, yet he ſuſpects them to be in a preternatural Condition.

Their Subſtance. Their Subſtance is naturally ſoft and ſucculent, cover'd with a common Membrane, and in Colour blackiſh.

Figure. Their Figure is various and irregular, ſome being almoſt oval, others longer, and ſhap'd more like a Raiſin; ſome triangular, *&c.* But the Surface of all is ſmooth enough to entitle them to the Name of *Conglobate Glands.*

Veſſels. They receive Arteries and Veins from the *Pulmonaries* for their common Function, and for their proper Nouriſhment from the *Bronchials*; their Nerves from the *Par Vagum*, eſpecially the *Cardiac Plexus.*

He confeſſes not yet to have ſeen their Excretory Ducts, but imagines them to be very ſhort, and to reach only from the Glands to the inward Surface of the *Bronchia.*

Uſe. Their Uſe he ſuppoſes to be to ſeparate that unctuous Humour, with which the inſide of the *Bronchia* is lin'd, and thereby to defend it from the Injuries which a cold harſh dry Air might otherwiſe ſubject the Lungs to: And he thinks that the Hoarſeneſs which ariſes from a Cold taken, may proceed from an Obſtruction of theſe Glands, and that the Benefit which accrues from taking *Oil of Almonds*, or other ſlippery ſmooth Medicaments, may proceed from their ſupplying the Defect of their Juice, and lubricating artificially the inſide of the *Bronchia.* But it's well known that the miliary Glands of the Wind-pipe and *Bronchia* ſupply that Humidity which moiſtens their inſides, and theſe are only *Lymphatick Glands*, that become tumid in morbid Caſes, inſomuch that they often preſs the Wind-pipe, or ſome of its Branches, before they enter the Lungs, and render the Patient *Aſthmatick*, which often proves fatal. Theſe Glands are ſcarce viſible in a *Fœtus*.

Veſſels of the Trachea. The *Trachea* has Arteries from the *Carotids* and from the *Bronchials*, and ſends Veins to the external Jugular. Theſe Veſſels accompany it thro' its whole Diſtribution.

The Lungs. Tab. xi. The Lungs, which are the immediate Organ of Reſpiration, conſiſt of Veſſels and membranous Veſicles.

Connexion. They are connected above to the *Fauces* by means of the *Trachea*, and below to the *Vertebræ* of the *Thorax*, and to the *Sternum* and *Diaphragm*, by means of the *Pleura*.

Ib. L. They are divided into two great *Lobes*, and thoſe again into others leſſer; the right ſometimes into three or four, by means of ſome Fiſſures running from the fore to the back edge.

Lobes. Tab. xi. L L. The great *Lobes*, when inflated, reſemble each of them a Horſe's hoof in Figure; but together they are liker an Ox's inverted.

Subſtance. The Subſtance of the Lungs is membranous, conſiſting chiefly of innumerable Cells or Veſicles, which ſeem to be nothing but Expanſions of the Membranes of the *Bronchia* to which they hang, like Grapes in Cluſters; ſo that by blowing into one of the Branches of the *Bronchia*, theſe Cells or Veſicles which belong to it will be blown up, the reſt, which do not, remaining ſtill flaccid and unalter'd.

Internal Lobules. Theſe Cluſters of Veſicles or Cells are call'd the internal *Lobules*, by which Names they are diſtinguiſh'd from the leſſer *Lobes* ſpoken of. Theſe *Lobules* are ſeparated from one another by Interſtices which receive the Veſſels, and are fill'd up with Membranes propagated from the *Lobules*, and lying ſome Parallel ſome Angular. Theſe *Lobules* diſcover and diſplay themſelves very exactly, if the larger Trunks of the *Bronchia* be laid open, and the leſſer be blow'd into, by which means every *Lobule* belonging to that Branch will be inflated, and riſe very diſtinctly, and ſhew its Extent.

Membrane. The whole Subſtance of the Lungs is cover'd with a common Membrane, which is diviſible into two Coats; the outer thin, ſmooth, and nervous; the inner ſomewhat thicker and rougher, conſiſting moſtly of the Extremities of Veſſels and Veſicles, through the Impreſſion of which it is pitted, and reſembles in ſome meaſure a Honey-Comb.

No Perforations. Some affirm that there are in this Coat abundance of Perforations or Pores, ſo diſpos'd, that they readily imbibe any Humidity from the Cavity of the *Thorax*, but ſuffer nothing to eſcape into it. But this ſeems to be a Fancy grounded upon no juſtifiable Obſervation.

Veſſels. Its Veſſels are the *Bronchia*, the pulmonary and bronchial Arteries and Veins, Nerves and Lymphaticks. Of theſe Veſſels ſome are Proper, ſome Common, in reſpect to the Service they are of to the reſt of the Body. The Common are the *Bronchia*, the pulmonary Artery and Vein, the Nerves and the Lymphaticks. The Proper are the bronchial Artery and Vein.

Bronchia. Ap. Tab. viii, ix, x. The *Trachea*, juſt before it enters the Lungs, divides it ſelf into two Branches, ſending to each *Lobe* one; which are again divided into innumerable Ramifications, which are call'd *Bronchia*. The *Bronchia* and their Branches conſiſt of Cartilages like the *Trachea*, only here the Cartilages are perfectly circular, without any membranous hinder part; of which, having left the *Oeſophagus*, they have no need. Theſe circular Cartilages are join'd together by the Membranes that inveſt them, and are capable of being ſhot out into length upon Inſpiration, and of ſhrinking up and running into one another in Exſpiration, when the Cavity of the *Thorax* is leſſen'd. They ſend their little Ramifications to all the little Veſicles of the Lungs.

Pulmonary Artery and Vein. Tab. xii, xiii, xiv.

Along with theſe Air-Veſſels run the Branches of the pulmonary Artery and Vein, ſending their Ramifications exactly along with the other. The Artery bringing the Blood from the right Ventricle, and the Vein carrying it back to the left Ventricle of the Heart. Whether the Blood returns by the Vein impregnated with Air in the Lungs, is ſtill a Queſtion.

Bronchial Artery. App. Tab. x.

The Bronchial Artery ariſes from the hinder part of the *Aorta*, a little above the *Baſis* of the Heart; whence turning off to the right, it embraces the *Trachea*, and after ſending off a Branch or two to the *Oeſophagus*, it purſues the Courſe of the *Bronchia*, accompanying all their Branches thro' their whole Progreſs. This Artery is ſometimes ſingle, but oftner there are two of them, and ſometimes three, which riſe at about a Finger's breadth, or leſs diſtance, from one another.

Vein.

Concomitant to theſe Arteries is a Vein, whoſe Branches ariſe from the Ramifications of the Capillary Arteries. Whether the Blood returns by one or more Trunks, is not yet ſufficiently apparent. Theſe Veſſels bring Blood for the Nutriment of the *Bronchia*, and Veſicles of the Lungs, and carry it back again.

Lymphaticks. App. Tab. ix.

Through the Lungs are diſtributed a great number of Lymphaticks attending generally the Blood-Veſſels, and being at length collected, empty themſelves into the Thoracic Duct.

Nerves.

Dr. *Willis*, contrary to the vulgar Opinion, aſcribes to the Lungs a great Number of Nerves, which come from the Trunk of the *Par Vagum*, which being diſtributed through the Subſtance of the Lungs, embrace the aerious and ſanguiferous Veſſels.

T A B. XII.

THE *Arteria Pulmonalis* fill'd with Wax, and freed from the Lungs and no more diſplay'd than they are ſuppos'd to be in Exſpiration, from an Adult as big as the Life.

A, Its Trunk cut cloſe to the *Baſis* of the Heart, and ty'd up.

B B, Its Diviſions to the right and left *Lobes* of the Lungs.

C, The *Canalis Arterioſus* converted into a Ligament.

bbb, The Extremities of the pulmonary Arteries freed from the Veſicles of the Lungs, and their Conjunctions with the pulmonary Veins.

CHAP. VII.

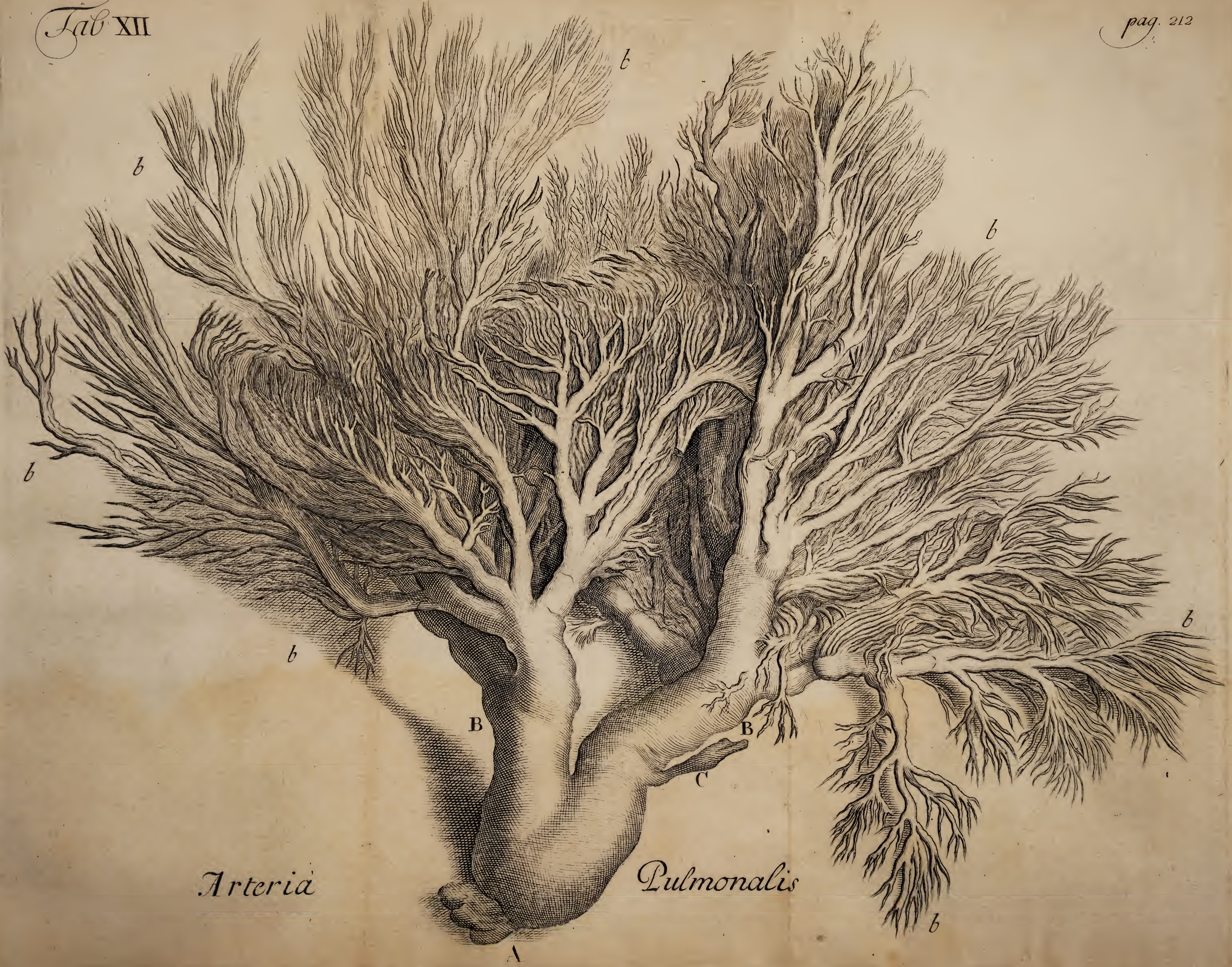
Of the Motion of the HEART, *and Uſe of* RESPIRATION.

Circulation of the Blood, by whom diſcover'd.

THO' divers accurate Treatiſes of the Heart, and its Action, have been written by learned Men of ſeveral Nations, eſpecially by two of our own Country, the Great Dr. HARVEY, to whoſe happy Sagacity this Nation owes the Glory of the Diſcovery of the CIRCULATION of the BLOOD; and the incomparable Dr LOWER, to whom we are beholden for a complete Diſplay of the *Mechanical Structure of th Heart*, and a moſt ingenious *Rationale* of its Action. Yet there remain ſeveral Doubts and Difficulties about it (in my Opinion) not ſufficientl accounted for; towards the reſolving ſome o which, I ſhall offer what my own Thought have ſuggeſted to me, and leave it to the Conſideration of the Reader.

Syſtole of the Heart ſufficiently accounted for by Dr. Lower.

The Learned Dr. LOWER (whoſe accurat Piece on this Argument will inſure his Reputation ſo long as Phyſical Knowledge ſhall laſt i Eſteem



Arteria Pulmonalis

Eſteem) has ſo well accounted for the SYSTOLE, or Contraction of the Heart from the Mechanical Structure of it, that he ſeems almoſt to have exhauſted the Subject, and had he been as happy in diſcovering the true Cauſe of the DIASTOLE, he had left little room for the Induſtry and Sagacity of others about this *Viſcus*.

Diaſtole not ſo by him or any other Writer.

But having judiciouſly and ſolidly explain'd the *Syſtole*, he contents himſelf to aſcribe the DIASTOLE to a Motion of Reſtitution, which Account gives me no Satisfaction: Becauſe the *Syſtole* being the proper, and (as himſelf confeſſes) the only Motion of the Heart, a State of Contraction ſeems to be the Natural State, and conſequently without external Violence, it ſhould have no *Diaſtole* at all.

Contraction the True Natural State of all Muſcles.

This will appear more plain, if we conſider the Circumſtances of it, and its Motion, as a Muſcle, with reſpect to other Muſcles. That Contraction is the proper Action and State of all Muſcles, is evident from Experience of Fact, as well as Reaſon. For, if any Muſcle be freed from the power of its Antagoniſt, it is immediately contracted, and is not by any Action of the Will or Spirits, to be reduc'd to a ſtate of Dilatation. Thus, if the *Muſculi Flexores* of any Joint be divided, the *Extenſores* of that Joint being by that means freed from the contrary Action of their Antagoniſts, that Joint is immediately extended without any conſent of the Will, and in that ſtate it remains; and ſo *Vice verſâ* if the *Extenſores* be divided. From whence it is plain, that the Muſcles have no Reſtitutive Motion, but what they derive from the Action of their Antagoniſts by which they are ballanc'd. Thus the *Sphincters* of the *Gula*, *Anus* and *Veſica*, having no proper Antagoniſts, are always in a ſtate of Contraction, and ſuffer nothing to paſs them, but what is forced through them by the contrary Action of ſome ſtronger Muſcles, which, tho' not properly to be call'd Antagoniſts, yet on all neceſſary Occaſions perform the Office of ſuch.

The Heart a Muſcle.

That the HEART is a Muſcle, furniſh'd and inſtructed for Motion like other Muſcles, is (in my Opinion at leaſt) demonſtrated beyond contradiction by Dr. *Lower* and others. And, as it is a Solitary Muſcle without any proper Antagoniſt, and not directly under the power of the Will, nor exerciſing Voluntary Motion, it approaches neareſt to the *Sphincter* kind, which only has theſe Conditions in common with it. But in conſtant and regular Alternations of Contraction and Dilatation, it differs exceedingly from all the Muſcles of the Body.

Reciprocal Æſtus *of the Heart.*

This Reciprocal *Æ*STUS of the *Heart* has given the Learned abundance of trouble; who finding nothing peculiar in the Structure, which ſhould neceſſarily occaſion it, nor any Antagoniſt, whoſe re-action ſhould produce it, have been extreamly perplexed to find out the cauſe of it.

But paſſing over the various Opinions of Authors, to avoid being tedious, I ſhall take notice here only of the very Learned Dr. *Lower*'s, in whoſe account of the *Syſtole*, however Solid and Ingenious, I obſerve ſomething deficient, and whoſe *Hypotheſis* of the *Diaſtole* I think to be precarious and falſe.

This excellent Author, having by ſound Arguments, drawn from the Structure and Mechaniſm of the Heart, eſtabliſh'd the certainty of its Muſcular Motion, reſts ſatisfied, without taking notice of any Aſſiſtance that the Heart receives from any other Part, except from the Brain, by the means of the eighth Pair of Nerves.

Borellus's *Computation of the Force of the Machine of the Heart.*

The Accurate *Borellus* in his *Oeconomia Animalis*, computes the Motive Power of the Machine of the Heart to be equal to, or to ſurmount that of a Weight of 3000 *l.* The Obſtacles to the

Part 2d. *Prop.* 67. *Prop.* 73.

the Motion of the Blood thro' the Arteries he eſteems equivalent to 180,000 *l.* which is ſixty times as much as he rates the Force of the Heart at. Then deducting 45,000 *l.* for the Adventitious Help of the Muſcular Elaſtick Coat of the Arteries, he leaves the Heart with a Force of 3,000 *l.* to overcome a reſiſtance of 135,000 *l.* *Prop.* 76. that is, with one to remove forty five.

He aſcribes it to Percuſſion.

This ſtupendous Effect he contents himſelf to aſcribe to the Energy of *Percuſſion.* But, had he proceeded in his Calculation to the Veins, which he allows to contain conſtantly a quantity of Blood, quadruple to the Contents of the Arteries, and to which this Energy of *Percuſſion* does either not reach at all, or but very languidly, he might probably have ſeen a neceſſity for ſome other Expedient to remove ſo inſuperable a Difficulty.

But not to inſiſt rigorouſly on the Exactneſs of this Calculation (tho' the great Abilities of the Author in this way, and his Ingenuity and Modeſty, are a ſufficient Warrant for the Accuracy of his Computations, and the Fidelity of his Accounts) we may allow a much greater Deduction than would be juſtifiable, without leſſening the Difficulty. But this Account I have taken notice of purely for the ſake of the Calculation, which may be of uſe in the Sequel, the Account it ſelf being in other reſpects more defective than Dr. *Lower*'s, to which we will return.

Defect in Dr. Lower's *Syſtole.*

The Doctor, notwithſtanding his great Sagacity, appears (to me) to have over-look'd ſomething of great Moment and Importance in the Explication of the Action of the Heart. For, tho' it ſhould be granted, that the Muſcular Fibres of the Heart acted by the Nerves, are the immediate Inſtruments of its Conſtriction or *Syſtole*, yet it muſt not be denied, that the Intercoſtal Muſcles and *Diaphragm* are of great Service

Intercoſtal Muſcles and Diaphragm *promote the* Syſtole *more than one way.*

to aid and facilitate this Contraction, by opening a Paſſage for the Blood through the Lungs, which denied would be an invincible Obſtacle.

Neither do they promote it that way only. The manner how they farther aſſiſt the Heart in its Contraction, will appear manifeſtly, if we conſider the different Poſture, Situation and Capacity of the Blood-Veſſels of the Lungs in the ſeveral times of Elevation and Depreſſion of the *Coſtæ*.

Riſe and Progreſs of the Pulmonary *Artery.*

The Pulmonary Artery riſes from the right Ventricle of the Heart, and runs in one Trunk till it comes to the *Aſpera Arteria*, where it is divided, and ſends a Branch along with each Diviſion of the *Aſpera Arteria*, according to all the minuteſt Subdiviſions, of which it is likewiſe ſubdivided, accompanying all the *Bronchi* in their whole Progreſs through the Lungs.

The ſame of the Vein.

The Pulmonary Vein, which empties it ſelf into the Left Ventricle of the Heart, ſpreads it ſelf on the *Aſpera Arteria* and *Bronchi*, in the ſame manner that the Artery does.

Conſequence of the Structure.

The neceſſary Conſequence of this Diſpoſition is, that this Artery and Vein being co-extended with, and faſten'd to the *Bronchi*, muſt needs ſuffer ſuch Alteration of Superficial Dimenſions, as the *Bronchi* do in the Elevation and Depreſſion of the *Coſtæ*.

Bronchi *ſhrink in Expiration, and ſo do the Blood-Veſſels that accompany them.*

While the Ribs are in a ſtate of Depreſſion (whether before Commerce with the external Air or after) the Annular Cartilages of the *Bronchi* ſhrink one into another, and by that means their Dimenſions are exceedingly contracted. In conformity to this condition of the *Bronchi*, the Pulmonary Artery and Vein muſt likewiſe, either by means of their Muſcular Coats contract themſelves to the ſame Dimenſions, or lye in Folds or Corrugations, which is leſs probable.

They ſhoot out, and divaricate in Inſpiration.

On the other hand, when the Ribs are elevated, and the *Diaphragm* bears downwards, the Air ruſhing into the Lungs, ſhoots out the Cartilaginous Rings, and divaricates the Branches of the *Trachea*, and by them extends and divaricates the ſeveral Diviſions of the Pulmonary Artery and Vein, and thereby lengthens and enlarges their Cavities.

Capacity of the Blood-Veſſels conſiderably enlarg'd thereby.

The enlargement of their Cavities is very conſiderable, not only upon the Score of the Addition, which they receive in length thereby, but alſo upon the Account of their Divarication. For whereas, when the Ribs are depreſs'd, and the Lungs ſubſide, the Blood-Veſſels are not only contracted, (as I have already obſerv'd) but their Branches which are exceeding numerous, approach one another, and lye in juxta-poſition, by which their Cavities are very much compreſs'd and ſtraitned: When the Ribs are elevated, and the Lungs turgid with Air, not only the Fibres, by which their Coats in the oppoſite State were contracted, are extended; but thoſe innumerable Veſſels, which lying before in Lines almoſt parallel one upon another, compreſs'd one another, making an acute Angle at their Junctures, are divaricated and ſeparated from each other, and make an obtuſe, whereby their Channels are widened.

Paſſage thereby open'd for the Blood.

Thus a Paſſage is open'd to the Blood, from the Right Ventricle of the Heart to the Left, through the Lungs, to which it could not otherwiſe paſs; and the Oppoſition which the Blood contain'd in that Ventricle, muſt otherwiſe neceſſarily have made to its Conſtriction, is taken off, and the *Syſtole* thereby facilitated.

Diaſtole *whereon depending.*

Nor is that all. For the *Diaſtole* being caus'd (as I ſhall in the ſequel ſhew) by the Force of the Blood ruſhing into the Ventricles, this Ampliation and Extenſion of the Pulmonary Artery is a ſort of Check or Counterpoiſe to it, and prevents an endeavour towards two contrary Actions at once, which muſt neceſſarily fruſtrate both. For the Heart being a Springy Compreſſible Body, whoſe proper Action, which is Contraction, depends on the Influx of certain Fluids in its Fibres or Subſtance; and containing beſides a Fluid in its Ventricles, or great Cavities, in one of which is the Mouth of this Artery, the Action of this Veſſel muſt in great meaſure reſemble that of a Syringe, whoſe Extremity is immers'd in Water, the Enlargement or Expanſion of the Channels of the Artery, anſwering the drawing of the *Embolum*, as the Conſtrictive Motion of the Muſcle of the Heart does the Preſſure of the *Atmoſphere* upon the Surface of the Water; the one making way for the Fluid, and the other forcing it to follow, where the Reſiſtance is leaſt. In this Senſe we may allow a ſort of Attraction to the Pulmonary Artery, depending wholly upon the Action of the Intercoſtal Muſcles and *Diaphragm* which we muſt therefore confeſs to be very ſerviceable and inſtrumental in promoting the *Syſtole* of the Heart.

Action of the Pulmonary Artery *compar'd to that of a Syringe.*

But if the Learned Author be deficient in his account of the *Syſtole*; that is, if he has not obſerv'd all the Mechaniſm and Contrivance of Nature for the Contraction of the Heart; much leſs ſufficiently has he accounted for the *Diaſtole*, or Dilatation of it; which he aſcribes to a Motion of Reſtitution of the over-ſtrain'd Fibres, which yet he confeſſes are made for Conſtriction only. 'Tis true, he immediately after joyns the Influx of the Blood as a concurrent cauſe; but from the ſlight Notice that he takes of it, 'tis plain, that he did not ſo much as dream of any great ſhare it had in that Action. His Words are theſe.

Quin & (ut obiter hoc moneam) cum omnis motus contractione perficiatur, & Cordis Fibræ ad conſtrictionem ſolum factæ ſint, apparet quoque Cordis motum totum *in* Syſtole *poſitum eſſe; cumq; Fibræ ultra tonum ſuum in omni conſtrictione ejus tendantur, idcirco ubi nixus iſte abſolvitur, motu quaſi* reſtitutionis *Cor iterum relaxatur, & ſanguine à Venis* influente *rurſus diſtenditur; à* nullo *enim cordis motu, niſi* tenſionem ſuam remittente, *& ab* irruente *ſanguine* Diaſtole *ejus libratis vicibus ſucoedit.*

De Corde Page 75.

Lower's Hypotheſis *of the* Diaſtole.

I have tranſcrib'd the entire Paragraph, becauſe it contains his whole *Hypotheſis* of the *Diaſtole*, and all the notice that he takes of it thro' his whole Work. But how ſlender ſoever this may prove, it is the moſt ſubſtantial that I have any where met with, except a late one of Mr. *Cowper*, which is properly an Improvement of this, and ſhall be conſider'd in the ſequel.

Diaſtole *a State of Violence.*

But, if Contraction be the ſole Action of theſe Fibres (as this Great Man confeſſes it to be) and as indeed it is of all Muſcular Fibres; I wonder how ſo judicious a Writer came to ſlip into ſuch an Abſurdity, as to call their Diſtention (vulgarly but improperly call'd Relaxation) a Motion of Reſtitution. For from the Nature of thoſe Fibres, and their Diſpoſition, the Structure of the Heart appears manifeſtly to be *Tonical*, and its Dilatation a State of Violence; and conſequently the Conſtriction is the true motion of Reſtitution, and the State to which it will ſpontaneouſly return, when the Force is taken off, which is the work of the Intercoſtal Muſcles and *Diaphragm.*

Thus we are left ſtill to ſeek for the true cauſe of the *Diaſtole*, which ſeems to me to be the main and moſt difficult *Phænomenon*, relating to the Heart and the Circulation of the Blood. But in Mr. *Cowper*'s ingenious Introduction to his *Anatomy*

Anatomy of human Bodies, I find the Share which Dr. *Lower* hints the Blood to have in that Action, farther proſecuted, and improv'd into the main Inſtrument of the Dilatation of the Heart, wherein I agree entirely with him. But as to the manner, and reaſons of its being ſo very Inſtrumental, I can't be ſo perfectly of his Mind.

Mr. Cowper's Hypotheſis.

The Heart (ſays this accurate Anatomiſt) *of an Animal bears a great Analogy to the Pendulums of thoſe Artificial* Automata, *Clocks and Watches, whilſt its Motion is perform'd like that of other Muſcles, the Blood doing the Office of a* Pondus.

Mr. Cowper's Pondus *conſider'd.*

By the Blood's doing the Office of a *Pondus*, I ſuppoſe he means, that the Blood contributes in the ſame manner to the Motion of the Heart, as the Weights do to that of the *Pendulum* of a Clock. If ſo, the Blood, according to him, muſt be the Inſtrument of Conſtriction; and Dilatation muſt be the Natural State, or Spontaneous Motion, to which it wou'd, when under no Violence, return; the contrary of which, I preſume, will appear ere I have done.

But if he means, that the Blood in its reflux, by gravitating on the Auricles and Ventricles, dilates and expands 'em, acting therein as a Counterpoiſe to its contraction as a Muſcle, I could wiſh his deſign had not bound him up to ſo narrow a compaſs, and that he had given us an Explication at large of ſo abſtruſe and ſo important a *Phænomenon.* Becauſe the Specifick Gravity of the Blood ſeems to me a Cauſe by no means alone, adequate to the Effect, which it is here ſuppos'd to produce.

Weight of the Deſcending *Blood.*

For, if the Blood acts only as a Weight by meer Gravitation, then that part of it only which deſcends from the Part above the Heart can be employ'd in that Action. This at the largeſt computation can't amount to five Pound Weight, and muſt, according to the computation of *Bo-*

rellus, force a Machine, that is able to overcome a reſiſtance of 135,000 *l.* I leave every Man to deduct what he ſhall upon examination find reaſonably to be deducted, and yet ſhall reſt ſecure, that it is not to be affected in the leaſt with ſo ſmall a Weight.

Meer Gravitation *of the* Refluent Blood *not ſufficient*

But neither does the Refluent Blood gravitate in any ſuch proportion, as I have here aſſign'd. For to make a true eſtimate of its Gravitation, we muſt conſider the circumſtances of the Liquor ſuppos'd to gravitate, in which it very much reſembles Water inclos'd in a recurve Tube, of which, if the length of the two Legs be equal, it may be ſuſpended in the Air full of Water, with the Extremities downwards, without loſing a drop, altho' the *Diameter* of thoſe Legs ſhould be very unequal. The Caſe of the Arteries and Veins is pretty near a Parallel to a Tube, ſo fill'd and inverted. For, if the Arteries and Veins be continued Tubes, (as by the Microſcope they ſeem to appear) then ſuppoſing their contents to have no other determination of Motion, than their Weight would give them, the contain'd Fluids muſt be counterpoiſes to each other. For the Veins and Arteries being join'd at the ſmaller Extremities, and the larger of both terminating in the ſame Parallel Line, it is impoſſible, according to the Laws of *Hydroſtaticks*, that the contents of either ſhould over-ballance t'other. How far then muſt it fall ſhort of forcing the natural Power and Reſiſtance of ſo ſtrong a Muſcle as the Heart, by meer Gravitation?

Nor the Progreſſive *or* Circulatory *Motion ſimply conſider'd.*

The Blood indeed has a *Progreſſive* Motion thro' its Veſſels, wherein it differs from Water in a recurve Tube, in the Experiment above ſtated. But, if the natural Gravitation of the Blood contributes nothing to the Dilatation of the Heart, this Progreſſive Motion will not be found much more ſufficient. For, as this Motion is de-

deriv'd entirely from the Heart's Conſtriction (as all accounts hitherto derive it) could the Blood be ſuppos'd to re-act upon the Heart, with all the force firſt impreſs'd upon it by the Heart, it wou'd be inſufficient, unleſs we will ſuppoſe the Force communicated to be ſuperior to the Power communicant, which is abſurd.

But when the juſt and neceſſary Deductions for the Impediments, which the Blood meets with in its Progreſs thro' the Veſſels, ſhall be made, the remaining Force will be found ſo exceeding weak, that to propel the Blood thro' the Veins may be a Task alone too great for ſo ſmall a Power, without charging it with the additional difficulty of forcing the Muſcle of the Heart.

We find it ſo far from equal to ſuch a Task, that, were it not for the Valves, which are placed in the Trunks of the Veins, the Weight alone wou'd probably be too great for the Impulſe, and the Blood never arrive at the Heart.

Diſparity *between the* Force *of the* Heart *and the* Reſiſtance *it meets with according to the Calculation of* Alphonſus Borellus.

Alphonſus Borellus, after a great deal of ſolemn Pains taken to ſhew his Care and Exactneſs, and to poſſeſs his Reader of the Truth of his Calculations, caſts up the Force of the Heart, and the Muſcular Coat of the Arteries, to be together equal to a Weight of 3,750 *l.* and allots 'em a Reſiſtance equal to 180,000 *l.* to overcome which is 45 to 1. To make up for a diſproportion, by his own Confeſſion, incredible to thoſe who have not conſider'd the Matter as he had done, he flings into the Scale the additional *Force of Percuſſion*, which he leaves *indefinite*, and thinks ſufficient to *force any quieſcent finite Reſiſtance whatſoever.*

But as this Account and Hypotheſis are part of a poſthumous Work, (if a liberty of Conjecture may be allow'd in ſo uncertain a Matter,) I ſhould ſuſpect that theſe Papers were left unfiniſh'd by

Borellus; or at leaſt, that in many Places the laſt Hand was never put to 'em. For, neither in this Place, nor any other of this Work, does he account for any more than the *Syſtole* of the Heart, and the reſiſtance which is made to the progreſſive Motion of the Blood in the Arteries only. This alone he found to exceed the Power of the Heart ſo prodigiouſly, that he ſeems to ſhuffle it off his Hands with a general and precarious Solution, as a difficulty that he was deſirous to be rid of. For, having aſcrib'd this ſtupendous (as he himſelf calls it) effect to the energy of Percuſſion, he takes no care to ſatisfy his Reader any farther about it, or to refer him, or give him the expectation of ſatisfaction any where elſe; altho' he has an expreſs Treatiſe on the *Force of Percuſſion*, which was written preparatory to this, and to which he frequently refers in other Places of this Work. But what confirms my Suſpicion, that this Part was intended for a farther Reviſe by the Author, is, that he has left the Progreſs of the Blood thro' the Veins, and the *Diaſtole* of the Heart, abſolutely untouched, tho' they are difficulties of a much greater Magnitude, than this which he has attempted to account ſo ſlightly for. For in theſe he is excluded the Benefit of Percuſſion, and has yet a greater reſiſtance to overcome without it. Omiſſions of this kind are ſo unuſual with this Author, where-ever he knows himſelf to go upon ſure grounds, that it is to me an Argument that he doubted the ſufficience of his Percuſſion, and reſerved theſe important *Phænomena* for farther Conſideration, without plunging himſelf into ſuch an Abſurdity as to aſcribe to Percuſſion any ſuch Energy, as to be able (ſo broken as it returns to the Heart) by its re-action to force that Power, from whence only it was firſt deriv'd.

Diaſtole *untouch'd by* Borellus.

Dr. *Lower* and Mr. *Cowper* deliver their Opinions of the Cauſe of the Dilatation of the Heart ſo very ſhort, and without any Arguments to ſupport 'em, that by expoſing them naked, they ſeem rather to diſcourſe of it tranſiently, as Men obliged by the Nature of their Subjects to ſay ſomething of it, than ſolicitous to give any full or ſatisfactory Account, and therefore I ſhall proceed no farther upon 'em here.

But tho' the *Hypotheſis* of *Borellus* may in this Caſe be found precarious or inſufficient, (a Miſfortune that has befallen him in divers other Particulars) his Theory holds good ſtill. At leaſt it ought to be allow'd in juſtice to his great Abilities and Exactneſs, till ſome body convicts him of ſome material Error in his Calculations, which has not as yet been done by any body, that I know of.

Suppoſing then the Force of the Heart, and of the Muſcular Coat of the Arteries, as likewiſe of the Reſiſtance, which they muſt overcome, to be computed with any degree of accuracy; there remains yet ſuch a prodigious diſproportion to be accounted for, as requires ſome more powerful agent, than any yet aſſign'd, to make up the deficiency.

What aſſiſtance the Heart receives from the action of the *Thorax* towards the facilitating its Contraction, without which aſſiſtance there cou'd have been no *Syſtole*, has been already ſhewn. But neither the *Intercoſtal* Muſcles, or *Diaphragm*, which are ſo inſtrumental in that part of its Action, can contribute any thing to the *Diaſtole*; becauſe they ſerve only to enlarge the cavity of the *Thorax*, and thereby to open a paſſage to the Blood from the Heart, and promote its Conſtriction.

Whatever therefore the Force is that dilates the Heart, and is the Cauſe of the *Diaſtole*, it muſt be equal to that of the Heart, the *Intercoſtal* Muſcles, and *Diaphragm*; to all which it acts as an Antagoniſt. I take no notice of the *Serratus Major Anticus*, and other Muſcles, which have an obſcure ſhare in the Elevation of the *Coſtæ*, becauſe as much may reaſonably be deducted upon the account of the *Obliquus externus Abdominis*, and other Muſcles; which, having their inſertions in ſome of the lower Ribs, are as inſtrumental towards the Depreſſion of 'em, and ſo ballance the account. But the chief uſe of theſe is in violent Reſpiration. In ordinary Reſpiration their ſhare is ſmall.

No ſufficient Power within the Body.

Such a real Power (which may in the leaſt be ſuſpected of any ſhare in this Action) is hard, perhaps impoſſible to be found in the *Machine* of an Animal Body; and yet without ſome ſuch Antagoniſt, it is as impoſſible the Circulation of the Blood ſhould be maintain'd. All the Engines yet diſcover'd within the Body conſpire towards the Conſtriction of the Heart, which is the State of Quieſcence, to which it naturally tends. Yet we find it alternately in a State of Violence, that is of Dilatation; and this upon neceſſity, becauſe upon this Alternation depends all Animal Life.

Some ſufficient external Cauſe muſt therefore be found, to produce this great *Phænomenon*, which Cauſe muſt be either in the Air, or *Atmoſphere*, becauſe we have no conſtant and immediate Commerce with any other *Media*.

The counterpoiſe external.

Some great Phyſicians obſerving this, and that depriv'd by whatſoever Means of Communication with the external Air, we became inſtantly extinct; have imagin'd, that in the Act of Inſpiration, certain purer Parts of the Air mix'd with the Blood in the Lungs, and were convey'd with it to the Heart, where they nouriſh'd a ſort of Vital Flame, which was the Cauſe of this reciprocal *Æſtus* of the Heart. Others not quite ſo groſs, rejecting an actual Flame, have fancied that theſe fine Parts of Air mixing with the Blood in the Ventricles of the Heart, produc'd an Effervеſcence which dilated it. But theſe Fancies have been long ſince exploded and condemn'd upon ample Conviction, and 'tis a Point yet undetermin'd, whether any Air does mix with the Blood at all in the Lungs, or not.

But ſuppoſing that ſome Air may inſinuate it ſelf into the *Pulmonary* Vein, it can no other way dilate the Heart than by an Effervеſcence in the left Ventricle, which would not dilate the right. But this Opinion is contradicted by *Autopſy*, and too laboriouſly confuted by others, to be brought upon the Stage again here.

There remains therefore only the groſs Body of the *Atmoſphere* to be conſider'd, which is undoubtedly the true Antagoniſt to all thoſe Muſcles, which ſerve for ordinary Inſpiration, and the Conſtriction of the Heart. This will appear more evidently, if we conſider not only the Power, but the Neceſſity of its Action upon Animal Bodies, as well as the want of other ſufficient Agents.

Heart and Muſcles of the Thorax *and* Diaphragm *have no Antagoniſts in the Body.*

The Heart is a ſolitary Muſcle of very great Strength, and the *Intercoſtal* Muſcles and Diaphragm, which likewiſe have no Antagoniſts, are a vaſt additional Force, which muſt be ballanc'd by the contrary Action of ſome equivalent Power or other. For, tho' the Action of the *Intercoſtal* Muſcle be voluntary, that does not exempt 'em from the Condition of all other Muſcles ſerving for voluntary Motion, which would be in a State of perpetual Contraction, notwithſtanding any Influence of the Will, were it not for the libration of Antagoniſt Muſcles. This libration between other Muſcles is anſwer'd by the Weight of the incumbent *Atmoſphere*, which preſſes upon the *Thorax* and other Parts of the Body. And, as in all other voluntary Motions the influence of the Will only gives a Prevalence to one, of two powers before equilibrated, ſo here it ſerves to enable thoſe Muſcles to lift up a Weight too ponderous for their Strength not ſo aſſiſted; and therefore as ſoon as that aſſiſtance is withdrawn, the *Coſtæ* are again depreſſed by the mere Gravitation of the *Atmoſphere*, which would otherwiſe remain elevated thro' the natural tendency of thoſe Muſcles to Contraction.

This is evidently prov'd from the *Torricellian* Experiments, and thoſe made upon Animals in Mr. *Boyle*'s Engine; where, as ſoon as the Air is withdrawn, and the preſſure thereby taken off, the Intercoſtal Muſcles and *Diaphragm* are contracted, and the Ribs elevated in an inſtant, and can't by any Power of the Will be made to ſubſide, till the Air is again let in to bear 'em forcibly down.

Error of D. Willis. *De Reſpirationis Organis & uſu.*

It was ſcarce worth while to take notice here of a Miſtake of the learned Dr. *Willis*, were it not for the great Authority of the Man, which is ſufficient to keep that Error in Countenance, even to this very Day. The Dr. having obſerv'd that the Fibres of the External and Internal *Intercoſtal* Muſcles ran in a contrary Order, as it were decuſſating each other, takes occaſion from thence to fancy, that there was an oppoſition in their Office, and that as the External ſerv'd to raiſe up the Ribs, the Internal drew 'em down again; forgetting at that time, that when a contractile Body is faſten'd at the ſeveral Ends to Points unequally moveable, let the Contraction happen in what part or manner ſoever, the more moveable Point muſt be drawn towards the leſs moveable: By which Rule, whether External or Internal *Intercoſtals* be contracted, the lower Ribs will be forc'd to approach the upper, that is, be rais'd up.

Power Antagoniſt to the Muſcles of the Heart and Thorax.

As in the Elevation of the *Coſtæ*, the Blood, by the paſſage that is open'd for it, is in a manner ſollicited into the Lungs, ſo in the Depreſſion of 'em, by the ſubſidence of the Lungs and the Contraction of the Blood-Veſſels, both which are conſequent thereof, the Blood is forcibly driven, as it were with an *Embolum*, thro' the Pulmonary Vein into the left Ventricle of the Heart. And this, together with the general Compreſſion of the Body by the Weight of the *Atmoſphere*, which ſurrounds and preſſes upon the whole Surface of it, is that Power which cauſes the Blood to mount in the Veins, after the force impreſs'd upon it by the Heart is broken and ſpent, and which is ſufficient to force the Heart from its natural State to Dilatation.

Animal Bodies compreſſible Machines.

He that is able to compute the Weight of a Column of Air, equal to the Surface of the whole Body, will readily grant it a Power ſufficient for the Effects, which are here aſcrib'd to it. And, when he conſiders, that the Bodies of Animals are compreſſible Machines, he will find that it muſt of neceſſity affect them in the manner here laid down. But though our Bodies be entirely compos'd of *Tubuli*, or Veſſels fill'd with Fluids, yet this Preſſure, how great ſoever, being equal, could have no effect upon 'em, if the ſuperficial Dimenſions were not eaſily variable; becauſe being compreſs'd on all parts with the ſame degree of Force, the contain'd Fluids could not any where begin to recede, and make way for the reſt to follow, but would remain as fixt and immovable as if they were actually Solid. But by the Dilatation of the *Thorax*, room is made for their Fluids to move, and by the Coarctation of it freſh motion is impreſt, which is the main Spring whereby the Circulation is ſet and kept going.

Reciprocal Dilatation and Contraction neceſſary to Animal Life.

This reciprocal Dilatation and Contraction of the ſuperficial Dimenſions of the Body ſeems ſo neceſſary to Animal Life, that there is not any Animal ſo imperfect as to want it, at leaſt none to the inward Structure, of which our Anatomical Diſcoveries have yet reach'd. For, though moſt kinds of Fiſh, and Inſects, want both moveable Ribs and Lungs, and conſequently have no dilatable *Thorax*, yet that want is made up to 'em by an *Analogous* Mechaniſm, anſwering ſufficiently the neceſſities of their Life.

Reſpiration of Fiſhes.

Thoſe Fiſhes, which have no Lungs, have *Gills*, which do the *Office* of Lungs, receiving and expelling alternately the Water, whereby the Blood-Veſſels ſuffer the ſame Alteration of Dimenſions, that they do in the Lungs of more perfect Animals.

Of Inſects.

The Lungs or Air Veſſels of Inſects are yet exceedingly more different in Structure, Diſtribution and Situation from thoſe of perfect Animals, than thoſe of Fiſhes are, and yet in their Uſe and Action agree perfectly with both; that is, removing and expelling the Air, and varying the Dimenſions and Capacities of the Blood-Veſſels. Theſe having no *Thorax*, or ſeparate Cavity for the Heart and Air-Veſſels, have the latter diſtributed through the whole Trunk of their Bodies, by which they communicate with the External Air through ſeveral *Spiracula* or Vent Holes, to which are faſten'd ſo many little *Tracheæ*, or Wind-pipes, which thence ſend their Branches to all the Muſcles, and *Viſcera*; and ſeem to accompany the Blood-Veſſels all over the Body, as they do in the Lungs only of perfect Animals. By this Diſpoſition in every Inſpiration, the whole Body of theſe little Animals is inflated, and in every expiration compreſs'd, and conſequently the Blood-Veſſels muſt ſuffer a viciſſitude of Extenſion and Contraction, and a greater motion muſt thereby be impreſs'd upon the Fluids contained in 'em, than the Heart, which does not in theſe

Creatures appear to be Muſcular, ſeems capable of giving.

The only Animal that is exempted from this neceſſary condition of Breathing, or receiving and expelling alternately ſome fluid into and out of the Body, is a *Fœtus.* But this, while included in the Womb, has little more than a vegetative Life, and ought ſcarce to be reckon'd among the number of Animals. For, were it not for that ſmall ſhare of Muſcular Motion, which it exerciſes in the Womb, it might without abſurdity be accounted for as a Graft upon, or Branch of the Mother.

Circulation in the Fœtus, *maintained by impulſe from the* Mother.

Boyle *of the Elaſticity of Air.* Pechlinus de Aeris & alimenti defectu.

Objections conſider'd.

Concerning the immediate matter, and means of Life, and Nutrition, Authors are not agreed; nor is it the buſineſs of this place to reconcile, or decide their differences, but to account for the motion of the Blood through the Veſſels only. In order to this, it will be neceſſary to obſerve, that the Pulſation of the Heart in a *Fœtus* is ſo very weak and obſcure, and the Motion of the Blood ſo extream ſlow and languid, as to be ſcarce, if at all, perceivable, as has been experienced in the Diſſection of Puppies before Reſpiration had. To produce ſuch a feeble Palpitation, and creeping Motion, no greater force ſeems to be requir'd than may be deriv'd from the Communication between the Veſſels of the Mother and *Fœtus* in the *Placenta.* I am not ignorant, that divers very Learned Anatomiſts (whom the Crowd have implicitly follow'd) have abſolutely rejected all Communication between theſe Veſſels. But, with ſubmiſſion to great Authorities, I think they have acted arbitrarily, and without ſufficient Warrant from Reaſon or Experiment. For neither are the Arguments which they bring againſt it concluſive, nor the Office which they aſſign to the Umbilical Veſſels in lieu of it, proper, or natural to thoſe Veſſels, or the reality of the Fact made out by any ſubſtantial Reaſons. Thoſe that reject this Communication uſually do it in favour of one or both of theſe Opinions, that the Arteries of the *Uterus* do depoſite a Nutritive Juice, or a Juice impregnate with Air in the *Placenta*, which is ſuck'd in by the Umbilical Vein, and convey'd to the *Fœtus*, for the neceſſary Uſes of Nutrition and Life. Now thoſe that patronize either of theſe Opinions lead Nature an unneceſſary dance. For if the Maternal Blood does really contain any ſuch Nutritions, or any ſuch neceſſary Aerial Particles, why ſhould they be ſeparated and extravaſated, to be with difficulty received into the Umbilical Vein, and again mixt with the Blood; when they might more eaſily have been imparted by the plain ſimple way of Transfuſion from the Arteries of the Mother to the Veins of the *Fœtus?* And, that this is the courſe which Nature takes in this caſe, I am perſuaded from the eaſineſs and ſimplicity of the Method, which readily performs what might be perhaps in vain expected from the other, and would over and above find them, what they ſeem to grope ſo blindly about for, a firſt Mover of the Blood in a *Fœtus*.

Objections againſt Nutrition *by the* Umbilical *Vein.*

Thoſe that contend for the conveyance of a Nutritious Juice, through the Umbilical Vein from the *Placenta*, are forc'd upon two difficulties next to Abſurdities. For firſt, they are oblig'd to make this Vein, which, as all other Veins, ſeems dedicated to the re-conveyance of Blood only, the proper and immediate Channel, through which a very different Liquor is to be carried; and next to give a Power of Attraction or Suction to it; becauſe the Nutritious Juice, which it is thus deſtin'd to carry, is both Viſcous and Stagnant, and has neither force to drive, nor ſubtilty to penetrate, or inſinuate it ſelf into the Capillary Veins; and therefore muſt be drawn or ſuck'd as Milk is from the Breaſt, to which the *Placenta* and its Nutritious Juice are by the favourers of 'em expreſly compar'd. But if this were the ſole uſe of the *Placenta*, and Umbilical Veſſels, why were the Umbilical Arteries ſent along with the Vein? Their Buſineſs is not to bring any thing back to the *Fœtus*, nor can they contribute any thing to the benefit of the Mother; for the Uterine Arteries bring all to the *Placenta*, the Umbilical Vein carries it to the *Fœtus*, and the Uterine Veins convey back again the Surcharge of the Mother's Blood; the Umbilical Arteries only have nothing to do, and are ſuperfluous and impertinent, which is contrary to the conſtant Practice of Nature. Yet if *Autopſy* did in the leaſt countenance this *Hypotheſis*, ſome defence might ſtill be made; but we find in the Umbilical Vein of a *Fœtus* nothing but Florid Blood, ſuch as in all probability it receiv'd immediately from the Arteries of the Mother without any Mixture. And therefore I can't help concluding, that this opinion engages its favourers in ſome Abſurdity, without Neceſſity and without Proof.

Fœtus *not ſupplied with Air from the* Placenta.

They that from the *Placenta* ſupply the Body of the *Fœtus* with Air, are as much diſtreſs'd as the other; for they are forc'd to beg the Queſtion twice, which, even when granted, will not anſwer their ends. Firſt, they ſuppoſe, that an intimate mixture or confuſion of Air with the Blood, is neceſſary for the ſupport of Animal Life; a *Poſtulation*, which perhaps the former part of this Diſcourſe may have render'd unneceſſary; and next that the *Fœtus* is ſupplied with Air from, and its Blood mixt with it in the *Placenta*.

But here again they fetch a Compaſs without neceſſity or proof. For if a mixture of Air were neceſſary to a *Fœtus*, why ſhould it be ſeparated from the Mother's Blood, and not rather both communicated together, ſince it is ſo much more eaſy and commodious? But neither does the *Placenta* ſeem to be inſtructed and provided for the ſeparation of Air, but of a much groſſer Florid, deſtin'd to ſome other uſe, which *Autopſy* confirms. Yet were both theſe opinions true, they are however defective, and the Circular Motion of the Blood unprovided for.

Transfuſion from the Mother *to the* Fœtus.

By the way of Transfuſion this great *Phœnomenon* is naturally accounted for; and the ends, for which the other two *Hypotheſes* were devis'd, might both be anſwered with more eaſe. For the *Hyſterick* Arteries tranſmitting their Blood immediately to the Umbilical Vein, may very eaſily tranſmit ſuch Nutritious Juices or Aerial Particles as are contain'd in the Blood, along with it, without depoſiting 'em by the way. By this means ſo much of the Impulſe of the Mother's Blood is preſerv'd, as ſuffices to maintain that languid Circulation, which a *Fœtus* enjoys. For the Blood being driven through the Arteries of the *Uterus* into the Umbilical Vein, is conveyed directly to the *Sinus* of the *Porta*, and thence by a ſhort and direct paſſage through the *Cava* to the Heart; where paſſing through the *Foramen Ovale* to the Left Ventricle, and through the *Canalis Arterioſus* from the Right and Pulmonary Artery, it is all deliver'd without coming at the Lungs, to the *Aorta*, and from thence again by the Umbilical Arteries to the Veins of the *Uterus*, making a ſort of *Epicycle* to the main Circulation in the Mother.

Arteries and Veins probably continued Tubes.

As this Opinion is favour'd by the ſtructure and diſpoſition of the Blood Veſſels on both parts, ſo there is nothing in it difficult to be conceiv'd, or repugnant to experience. Late Diſcoveries have made it appear, that the Arteries and Veins are continued Tubes, and that the latter contain nothing but what they receive from the former; and no reaſon appears why we ſhou'd think this

Method to be varied in the *Placenta.* On the other hand, if the Arteries of the *Uterus* were continued to the Veins of the ſame part, and thoſe of the *Fœtus* in like manner, without communicating with each other, their confluence in the *Placenta* ſeems to be altogether impertinent and of no uſe, and the Umbilical Arteries and Vein fram'd for no other ſervice or purpoſe, than to give the Blood room for an idle Sally.

Mr. Cowper's *Experiment.*

Thus the reaſonableneſs of this old Opinion may be vindicated, but the certainty of it reſts upon ſtronger proof. Mr. *Cowper*, to whoſe happy Induſtry we owe the Confirmation of many Antient Diſcoveries, and the benefit of ſome new ones, has the Honour to re-eſtabliſh this Old, but long exploded Truth. For by pouring Mercury into a Branch of the Uterine Artery of a Cow, that went into one of the *Cotyledones* of the *Uterus*, he fill'd thoſe Branches of the Umbilical Veins, which went from that *Cotyledon* to the Navel of the *Fœtus*; which with a part of the *Uterus* he keeps prepar'd by him.

It would be a weak Objection, to alledge that the Obſervation and Experiment being made on the *Uterus* of a Cow, the inference wou'd not hold from thence to a Woman, the one being *Glanduliferous*, and the other *Placentiferous*; ſince every one of theſe *Cotyledones*, or Uterine Glandules, is in all reſpects a little *Placenta*, and all the difference between them is in number, name, and magnitude. Why Ruminants differ in this particular from other Viviparous Animals, is beſide the ſubject of our preſent Enquiry. But the great Flux of Blood which conſtantly follows upon drawing the *Placenta* from Women (which is frequently ſo great as to coſt them their Lives) is as plain a demonſtration to Reaſon of the Continuity of the Veſſels, as Mr. *Cowper*'s Experiment to the Eye.

I have heard it objected by very Learned Men, that if there were ſuch a Continuity of Veſſels, and ſuch Transfuſion of Blood, the *Fœtus* muſt neceſſarily periſh through loſs of Blood, upon the ſeparation of the *Placenta* from the *Uterus*; but that on the contrary no conſiderable flux of Blood does follow while the *Fœtus* continues wrapt in the Membrane, in which condition it may be kept alive ſome Hours. To this it may be anſwer'd, that the Circulation in the *Fœtus* being deriv'd from the Mother, may be ſuppos'd wholly to ceaſe upon the cutting off the communication between them, till it is again renew'd more forcibly by Reſpiration. But if we allow the Motion already impreſs'd upon the Blood to be ſufficient to keep it going a little while; yet it muſt needs be ſo exceeding languid, that the mere reſiſtance of the external Air muſt be more than enough to hinder any Efflux of Blood from a *Fœtus* before Reſpiration. How long Life may be preſerv'd without an actual Circulation of the Blood, is a Queſtion not of this place. But we have been convinc'd by many and notorious Obſervations and Experiments, that Life has been recover'd a long time after all Tokens of Reſpiration, Circulation, or even Life itſelf have diſappear'd, ſo that we can't think the firſt Solution either impoſſible or improbable.

Objections Anſwered.

I expect to be told, that in the early Days of Geſtation in Viviparous Animals there is no *Placenta*, or any Adhæſion of the Umbilical Veſſels to any part of the Mother, and conſequently no ſuch Transfuſion; and that in Oviparous there is no Continuity, or Communication of Veſſels of any kind, during the whole time of Incubation.

Want of Continuity before Adhæſion.

But theſe Objections carry neither the Weight nor Difficulty along with them, that they may be ſuppos'd to do; for in thoſe days there is neither Blood nor Blood Veſſels, and conſequently there

Accounted for.

there can be no Circulation of the Blood; and the *Embryo*, of what Species ſoever, is no more than a Vegetable at that time; nor does the *Fœtus* of any Viviparous Creature enjoy any Circulation, or ſhew any ſigns of Animal Life, till after thoſe Veſſels, as well as others requiſite to the Circulation, are compleated.

And in Oviparous Animals.

It muſt be confeſs'd, that Oviparous Animals are denied the Benefit of this Communication: But that want is ſufficiently compenſated by a peculiar Mechaniſm, which directly anſwers the ends of Reſpiration, and the Preſſure of the *Atmoſphere* upon the *Fœtus*. There is at the Obtuſe end of an Egg a ſmall Cavity fill'd with Air, which is the Succedaneous Inſtrument to the Reſpiratory Organs. For as ſoon as the Contents begin to be warm'd by the Incubation of the Hen, or any Analogous Heat of Furnace or Dunghil, the ſeveral Humours of the Egg acquire a Fermentative Motion, and the Air contain'd in the Cavity or Veſicle at the obtuſe end of the Egg is rarified, and the Veſicle extended and enlarged; and conſequently the other contents are compreſt, which the Fermentative Motion naturally reſiſts. But both Bodies being as well compreſſible as dilatable, and both having an Expanſive Motion impreſt upon them by Incubation, the compreſſion and renitency will be mutual; but varied in degree, according as either, through the variation of Circumſtances, ſhall prevail. By this means, an Alteration of Compreſſion and Dilatation will be produc'd in both anſwering the Reſpiratory Motion, by which a Motion will be communicated, which, as ſoon as the Organs (by which it ſhou'd be regulated) are compleated, will in the Body of the *Pullus* be Regular and Circulatory.

Uſe of the Cavity at the Obtuſe End of an Egg.

Miſtaken by Fabritius, &c.

Fabritius ab Aquapendente, and after him our Great Dr. *Harvey*, have aſſign'd divers uſes to this Cavity or Air-Veſicle, the Extravagance of which have perhaps deterr'd others from enquiring ſo much into the Uſe, as the importance of it requir'd. But tho' I cannot agree to that Perſpiration, Refrigeration, and Reſpiration, which they make it the Inſtrument of, yet perhaps the Air, that was inclos'd in that Cavity, may thro' the augmentation of the Body of the *Pullus*, and its own Rarefaction, (which is at laſt ſo great as to occupy half the Shell) break the Membrane, which ſeparated it from the *Pullus*, and thereby give ſo much Reſpiration as to form the chirping Voice, which is often heard before the breaking of the Shell, and with it give an Addition of Strength to enable it to break the Shell. But how it ſhou'd reſpire ſooner is to me inconceivable.

There are many Problems of great ſeeming difficulty, the Solutions of which flow naturally from what has been laid down here: But intending to proſecute this Subject farther, and to treat of the Impediments of Reſpiration, and the conſequences of Reſpiration obſtructed or intermitted, in a Treatiſe expreſly on that Subject; I ſhall reſerve them for that opportunity, and content myſelf here to attempt the *Herveyan* Problem only, which has given abundance of Authors ſo much perplexity.

Harveyan Problem.

That incomparable Philoſopher enquires, *Why a* Fœtus, *taken out of the* Uterus *with the Membranes entire, ſhall live in Water ſome Hours without Communication with the External Air? whereas if it be taken out and ſuffer'd once to breath, it can't afterwards ſurvive a Moment without the Benefit of Reſpiration.*

Attempted.

Granting the Fact to be as he has deliver'd it, which yet is not ſo in all Caſes, the main difficulty is grounded on a Miſtake, which from the ſtating of the Queſtion I find this Great Man to have ſlipt into. For he thinks, that a *Fœtus* is ſooner ſuffocated after having once breath'd, than if it had not breath'd at all, and that by breathing it had contracted ſomething which render'd it more periſhable. *Idem tamen ſecundis exutus,* (ſays he) *ſi ſemel* aerem *intra* Pulmones *attraxerit, poſtea ne momentum quidem temporis abſq; eo durare poſſit, ſed confeſtim moriatur?* And preſently after, *Siquidem conſtat, fœtum, poſtquam eum* ſemel *hauſerit,* citius *ſuffocari; quam cum ab* illo prorſus *arcebatur.* The Doctor obſerving a *Fœtus* to live longer without Reſpiration, and to diſpenſe better with the want of Air while included in the Membranes entire, than it cou'd afterwards; infers thence, that the Air does in the firſt Act of Inſpiration impreſs upon the Lungs ſome quality, which renders it ever after more indiſpenſably neceſſary. But allowing his Obſervation, I muſt yet deny his Inference to be good: For, deprive a *Fœtus* of means of reſpiring, and then take it out of the Membranes, and it ſhall be as ſoon ſuffocated, as if it had reſpired before. This proves, that this Neceſſity of intercourſe with the Air by way of the Lungs is not the Off-ſpring, but the Parent of Reſpiration, and that, that Learned Man was drawn into a Fallacy of *Non cauſa pro cauſa.*

Harv. de Gen. Anim. Cap. de Partis.

Neceſſity of Reſpiration after Birth whence.

The reaſon of this Neceſſity is the preſſure of the External Air upon the Surface of the Body, from which it was defended by the interpoſition of the Membranes and the Humours contain'd, which are not ſo compreſſible, as the Body of the *Fœtus* itſelf. So ſoon therefore as the *Fœtus* is excluded, and expos'd to the immediate contact of the ambient *Atmoſphere,* the Veſſels and all the Cavities of the Body muſt neceſſarily be ſo compreſs'd, that the Fluids can't have room for Motion, and conſequently the *Fœtus* cou'd have no Life, if Nature had not contriv'd by the

pag. 239.

Motion of the *Thorax* to remove and admit that preſſure alternately, and thereby to impreſs a Motion on the Fluids, which is the Spring of Life. But this Motion of the *Thorax* being any way ſuppreſs'd, the equal preſſure of the *Atmoſphere* on all parts occaſions a total Ceſſation of Motion, which is Death.

I ſhall proſecute this Subject no farther now, nor trouble the Reader with any Apology for diſſenting from thoſe great Men herein named; becauſe, I hope, I have done it with Modeſty, and all the Reſpect due to ſo great Authorities, and have aſſign'd nothing which is not matter of Fact uncontroverted, or deduc'd from it by plain Mechanical Neceſſity.

TAB. XIII.

THE Trunk of the *Vena Pulmonaris*, with its Branches fill'd with Wax, ſeparated from the Lungs, and diſplay'd as in Inſpiration.

AA. The Bulbous Trunk of the Vein.

B. Its Orifice ty'd up, when cut from the left Ventricle, cloſe to the Baſis of the Heart.

C. The left Auricle of the Heart, fill'd with Wax.

D E. The Trunks and Branches of the Pulmonick Veins of the right and left Lobes of the Lungs, in which it's obſervable thoſe of the right ſide are larger, and more numerous than thoſe of the left.

CHAP. VIII.

Of SANGUIFICATION *and* NUTRITION.

Blood.

THE BLOOD *is a warm, red Liquor, circulating by means of the* Arteries *and* Veins, *through every part of the* Body.

While circulating an Homogenicus Liquor.

While it circulates in the Veſſels, it appears a homogeneous or uniform Liquor, but being let out, as it gradually cools, it ſeparates ſpontaneouſly into two diſtinct Parts, a *Craſſamentum*, or red coherent Maſs, and a *Serum* or tranſparent part which ſtill retains its Fluidity, and being ſomething the more ſpecifically heavy of the two, ſuſtains and bears up the red part which ſwims in it. The proportion of which two, in the mixt, is ordinarily about one and a half of the *Serum* to one of the *Craſſamentum*. I have pitch'd upon this Proportion as a Medium between the Exceſſes on both ſides. But the Reader is not to be ſurpriz'd, if he ſometimes finds the Proportion vaſtly different from what I have here given, even in Perſons of ſound Health. For as to this Point, Nature ſeems not to have ſettled any perfect Standard, but the Blood of ſome will be more watry or ſerous, of others more fibrous, than this Proportion ſeems to allow; and yet no viſible difference be found in the Perſons as to point of Health. And therefore I propoſe this as a Meaſure of a thing not reduc'd to a Certainty, and in which therefore a great Latitude is to be allow'd.

Separates when let out into Serum *and* Craſſamentum.

Proportion not abſolutely determinable.

The Blood is deriv'd from the *Chyle*, which, having paſs'd the *Lacteals* of the ſeveral kinds, is deliver'd into the Blood at the *Subclavian*; whence they paſs together to the right Ventricle of the Heart, and there, being yet more intimately mixt, circulate thenceforwards together through the whole Body; till after ſeveral Circulations and Depurations at the ſeveral Colatures of the Body, they are, as the *Chymiſts* call it, cohobated, or aſſimulated, ſo as to make one uniform compound Maſs, which ſeems to be nothing elſe but *Chyle* alter'd by the Artifice of Nature, and exalted into Blood. For it does not appear that any thing extraneous is mixt with the Liquor circulating in the Blood-Veſſels, but *Chyle*, except what was firſt ſeparated from it for particular Uſes, and what after having ſerv'd them is return'd

Blood deriv'd from Chyle.

turn'd to it. Unleſs, perhaps, it may receive ſome Portion of Air in the Lungs, which has been a Queſtion much agitated *Pro* and *Con*, but not yet brought to any certain Deciſion, by any Arguments that I could yet ſee for either ſide of the Queſtion.

Air in the Blood.

How introduced uncertain, otherwiſe than with the Chyle

That there is a quantity of Air mix'd with the Blood, and circulating along with it, is paſt doubt; but whether any more than was at firſt contain'd in the Bodies, out of which the *Chyle* was form'd, and was than tranſmitted along with it to the Blood, is a Queſtion not yet decided. Nor perhaps is it eaſy to find Arguments that ſhall be demonſtratively concluſive either way. Tho' if there were any Air introduc'd into the Blood by any other Paſſage than the Lacteals, in the manner already mentioned, it would be a Diſcovery of very great Importance, and that might tend to the Solution of many doubtful Problems in the Animal Oeconomy, if the Way and Method of its entrance could be clearly demonſtrated; but that not being done, even for the Lungs, (the moſt probable way) I ſhall not preſume ſo far as abſolutely either to receive or reject the Opinion.

Arguments for mixture of Air with the Blood in the Lungs.

The neceſſity of Reſpiration, and the florid Colour which the Blood receives in the Lungs, and firſt ſhews in the *Vena Pulmonaris*, are the Arguments which thoſe, who contend for the Admiſſion of the Air into the Blood that way, inſiſt moſt upon. For the firſt of 'em I have already accounted another way, in *Chap.* VII. of this Book. The latter is chiefly ſupported by the Experiment of turning the grumous red part of the Blood after Coagulation upon Blood-letting, by which it is obſerv'd that the under Surface, which was before blackiſh, being turn'd up, and expos'd to the Air, acquires a florid Colour like that of the Blood in the *Vena Pulmona-*

ris, from whence they argue that this Change wrought, is in both Caſes by the ſame means, *viz.* The Contact of the Air. But for this Change in the Lungs, thoſe that oppoſe the Admiſſion of the Air, pretend to account by the extraordinary Agitation of the Blood in the Lungs, which they think ſufficient by Comminution only to impart the bright Colour.

Experiment in favour of that Opinion.

There is an Experiment indeed which ſeems to favour the real Admiſſion of Air, which is, that keeping the Lungs of a Sheep, or other Animal, in a pendulous Poſture, if Water be pour'd into the *Trachea*, till it be full, the Water will firſt inſinuate it ſelf into the Air-Veſſels, and thence return very freely thro' the Blood-Veſſels. This I have tried very often, but, as I obſerv'd, it would flow as freely from the Artery as the Vein, which, together with the hydropical Diſtenſion of the Veſicles themſelves, render'd it ſuſpected to me, that the Continuity of thoſe very tender Parts was broken by the Weight of the Water; and therefore I dare not lay too much ſtreſs upon this Experiment, but propound it only in order to farther and leſs ſuſpicious Tryals.

Air the ſpring of inteſtine Motion in the Blood.

But whenceſoever deriv'd, and how little ſoever it may be, this included Air is that which gives the expanſive Motion or Spring to the Maſs of Blood; and conſequently is the Cauſe of the incaleſcence, or warmth of it, which may thence eaſily be accounted for, without having recourſe to Acids and Alkalies, or chymical Principles. For Air (whereſoever included) is compreſs'd, as it muſt neceſſarily be in all Liquors, and will endeavour to expand it ſelf; and conſequently, if it be ſtrong enough, drive outward the parts of the Body thatincloſe it: By which means it cauſes the Blood to beat againſt the ſides of the Veſſels, which having Muſculous Contractile Coats, do in their turns compreſs it again, and ſo cauſe a reciprocal *Æſtus* in the Blood greater than the mere circulatory Motion could; whence the parts of the Solids, or containing Veſſels, being put into a conſtant Agitation, as well as the Fluids, a Heat is produced in both, which they mutually impart to each other.

Analyſis *of the Blood.*

Beſides this Air, the Blood conſiſts of ſeveral ſorts of Parts; to ſome one or more of which, and their mutual action upon one another, the inteſtine Motion of the Blood has hitherto generally been imputed. Thoſe which upon the *Analyſis* offer themſelves to our view, are two ſorts, as Salts, and a Quantity of Oil; which by ſome nice *Examens* has likewiſe been found to be of two ſorts; a great deal of Phlegm or Water, and a good Quantity of *Caput Mortuum*; which however ſimple it may appear, may for ought we know conſiſt of divers Subſtances eſſentially diſtinct from one another: But for want of ſufficient ways of probation, all that we get out of it is a little fixt Salt by Incineration.

Chymiſts Account of the Colour precarious.

The Chymiſts, according to their wonted Method and Principles, account for the Colour of the Blood from the Exaltation of its *Sulphur*; which, whether true or falſe, is *gratis dictum*, and altogether as unſatisfactory as it is arbitrary. However, ſince the Doctrine of Colours in general is not applicable to Medicinal Uſe, it is not an Enquiry very neceſſary to be proſecuted in an Anatomical Work.

Borellus's *Account.*

However, that accurate ſagacious Enquirer, *Alphonſus Borellus*, not ſatisfy'd with ſuch wide Vague Idea's of natural Cauſes; thought fit to examine the Ground or *Materia Subſtrata* of the redneſs of the Blood, by a Method more ſimple, and I think, in ſuch Caſes, more likely to ſucceed than the Chymical; which deſtroys the Concrete, and with a new Texture introduces new Colours and Appearances. * He took a par-

* De Motu Animalium, *Part* ii. *Prop.* 122.

cel of the *Craſſamentum*, after it had ſeparated it ſelf from the *Serum*, as far as ſpontaneouſly it wou'd, and waſhing it frequently in Water, found, that by that way it was ſeparable into a viſcous ſlippery ſubſtance, conſiſting of white or colourleſs Fibres, which riſes to the Surface of the Water, and there gathers into a Skim, or coherent Pellicle of a reticular Texture, and deep red Powder, which precipitated pretty plentifully to the bottom.

This Experiment ſhews, that the red Colour of the Blood is imparted to the Blood by particular tinging Particles, as in the common Experiments of *Dyers*, tho' not ſo inſeparably as many of theirs, moſt of which they know however very well how to diſcharge. It might therefore be very well worth that Man's while, who will reaſon about the Colour of the Blood from the Hypoſtatical Principles of the Chymiſts, to examine the red Precipitate apart, and ſee with which of their Elements it moſt abounds, which might perhaps teach 'em to be more wary in pronouncing about the Original of Colours; and with this Caution I leave it to their Inquiſition.

Blood not neceſſarily red.

This fine red Colour, however generally found in the Blood of terreſtrious Animals, and moſt others, is not abſolutely neceſſary or eſſential to it. For, beſides that divers whole Species have their circulating Liquor white or limpid, which I ſhould not ſcruple to call Blood, I have ſeen Blood let out to the Quantity of a Pint or more from the *Median* of a Man, which was all of a pure milk white, which did not when cold ſeparate into a *Craſſamentum*, as the red uſually does, nor yield a Skim or Cream, nor turn ſour upon keeping as Milk does, which to appearance it very much reſembled; but remain'd ſweet without parting Subſtances for ſome Weeks, and at laſt corrupted and ſtank; after almoſt three Months, and

White Blood.

and that I kept it fluid in a Viol, then a very ſlight ſeparation enſued of the whiter part, from a whey-colour'd Liquor; but neither was the *Coagulum* near ſo ſtrong as that of ſour Milk, nor the Liquor ſo tranſparent as *Serum* or Whey, nor either in Smell or Taſte enclin'd to be ſour, but had at laſt a Smell pretty ſtrong of Putrefaction. The Man from whom it was drawn was lightly Cachectical, and both his Looks and Complaints were like thoſe of Maids not very far gone in a *Chloroſis*.

Broth inſtead of Blood voided at the Noſe, from Dr. Lower.

Divers other Inſtances are to be found in Authors, of Blood that was not red; and Dr. *Lower*, in his Book *De Corde*, relates a remarkable Caſe of one that bled ſo long at the Noſe, that at laſt the Broth which he drank for his Supper, flow'd, little alter'd that way, as Blood. But that Caſe of the white Blood, above recited, being the moſt complete in its kind that I ever ſaw or read; a Change made without any accidental Circumſtances of Force, or the Attendance of any extraordinary Inconveniencies; which was in a manner habitual, and did not probably come upon the Man in an Inſtant, or a ſhort time, nor vaniſh ſo, but in all Appearance had its leiſurely Steps and Gradations; during part, at leaſt, of which time the Man muſt live, and do all the Offices of Life, which he ſeem'd to do in the main as well as others, (eſpecially as ſuch to whom we have above compar'd his State) without what is vulgarly call'd Blood. I have propoſed it more at large, that they who trouble themſelves to reaſon about the eſſential Qualities of Blood, may at leiſure conſider wherein the Defect lay.

The Chymiſts, perhaps, will readily tell us, that Blood is a Liquor more ſulphureous than Milk; and that in this Blood, which reſembled Milk ſo much, the *Sulphur* was not ſufficiently exalted to give the red Tincture which they derive from that Principle.

Colour of the Blood from the mixture of Air unprov'd.

On the other hand, they who fetch the Colour from the Impregnation of the Air in the Lungs, may fancy a Defect or Obſtruction of the paſſage of the Air into the Blood in that part, by which means it was defrauded of that Colour or Spirituoſity which otherwiſe it ſhould have had.

Either of theſe Opinions may be true, but they are both unprov'd, and therefore neither to be inſiſted on. But there is another Difficulty, which is, that this white Blood, after it had been let out from the Vein above the uſual Time of Separation, either in Blood or Milk; did not yet follow the Courſe of either, but ſtill preſerv'd its mixture, without parting into a *Craſſamentum* and *Serum*, or into a *Coagulum* and Whey.

Here the Chymiſts have a fair Opportunity to pretend a Libration or equal Temperature of their Salts; and to ſay that the Proportion of 'em was ſuch that the Alkalious hinder'd the Acid from procuring a *Coagulum*, and the Acid prevented a ſpeedy Corruption from the Volatile Alkalious, and ſo betwixt 'em preſerv'd the State that it appear'd in, at the firſt letting out, longer than is uſual in Liquors that have had their due Exaltation.

On the other hand, they that hold the mixture of Air, with the Blood in the Lungs, may (at leaſt with equal Reaſon) ſay, that this Blood not having received in the Lungs a Quantity of Air ſufficient for its Perfection and Colour, contain'd yet enough to maintain it in the State of Fluidity, though not ſufficient to bring it ſpeedily to Putrefaction, which however it did at laſt, after an unuſual length of Time.

For my own part, who think the Colour of the Blood to depend upon other Circumſtances (not neceſſary to my Purpoſe) than the Exaltation of *Sulphur*, or the Quantity of Air contain'd in it; I leave it to the farther Enquiry of thoſe whom the like Obſervation ſhall furniſh with better means to ſearch into the Cauſe of it, than I at that time had.

Chymical Elements of the Blood.

But to return to the Hiſtory of laudable well-conſtituted Blood, the viſible Elements of it are thoſe which the Laboratories of the Chymiſts produce ſeparate, tho' perhaps much alter'd by the Furnace. For it is paſt all Controverſy, that the Empyreumatical Oils drawn from Blood by Fire, differ, *toto Cœlo*, from the natural Fat, or Oil, which circulates with the Blood. Nor is it improbable that the Salts rais'd from Blood, or other Animal Liquors, are in the Operation very much acuated: Or at leaſt, that the various Combinations of'em, by which they were circulated in the Blood, are ſo deſtroy'd, as to render them quite a different thing from what they were in the natural State. It may likewiſe be a reaſonable doubt, whether that Earth, or *Caput Mortuum*, which remains in the Retort after the Diſtillation ended, be not a new Production, which had no Exiſtence under any Form reſembling that in the Blood it ſelf; and it is probable that it is the Reſult of the heavier Salts and Oils, which being deſtitute of their more fluid Parts, are in a manner torrefy'd in the Proceſs, and put on a Shape, Conſiſtence, and Rigidity, which naturally they never had.

Nouriſhment of the Bones.

But this latter Doubt I would not extend too far, becauſe the Nouriſhment of the Bones, ſeems neceſſarily to require ſomething more Solid than Oil, and leſs fluxil than Salt, which may ſerve to give a Conſiſtence, and Temper to thoſe two, of which the Bones by their *Analyſis* are found mainly to conſiſt.

Alterations of which the Blood is ſuſceptible. From thoſe Principles or Elements, variouſly combin'd and diſtributed by the Circulatory Motion impreſs'd by the Heart, as has been already ſhewn, Chap. VII. of this Book, and by the Oſcillatory Expanſive Motion of the interſpers'd Air, and the Re-action, and Reſilition of the Contractile Veſſels through which it paſſes, flow all the Properties and Operations of the Blood. From this mixture of Elements and their lax Compoſition it is ſuſceptible of various Alterations and Impreſſions, of which the Principal are Coagulation, which almoſt conſtantly attends the parts of it, when out of the Body; but if generally within the Body, it muſt be Mortal inſtantaneouſly; and therefore ſuch a State of the Blood does not appear ever to have happen'd without Artificial Procurement: Diſſolution which is an Affection juſt contrary to the former, and is ſuch a Comminution of the Fibrous parts of the Blood, as indiſpoſes it for that ſeparation of the *Craſſamentum* from the Serous part, which always enſues in Healthy Blood upon cooling out of the Body, if received into a deep Veſſel. For upon a plain Surface it will not ſeparate. This Diſſolution or broken Texture of the Blood is often the Conſequence of Malignant and Peſtilential Fevers, and ſhews it ſelf in the *Petechiæ*, Purple Spots; and in many of theſe Caſes the Blood taken away by Plebotomy will not ſeparate into a *Craſſamentum* and Serous Part. This ſort of Diſſolution is likewiſe occaſioned by ſome kinds of Poyſons, among which may be reckon'd the Bites of Venomous Animals, as Rattle Snakes, Vipers, *&c.* In ſome of which however the Diſſolution is not Total, but Partial, and therefore overcome by proper Applications. Thoſe two contrary Affections of the Blood, when they ſpring from an Internal Courſe, ariſe from the oppoſite kinds of Salts, Acids, and

Coagulation.

Diſſolution.

Volatile Alkalies. For though in an Humane Body, no ſincere Acid is to be found, nor cou'd it indeed be conſiſtent with Life; yet it may, and does, often enter the Blood ſo compounded, as to bridle the Volatile Alkalious, which is the true Salt of the Blood; and ſo hinder the due Attenuation and Mixture of the ſeveral Parts, as in the Caſe of a *Diabetes*, and perhaps in a *Chloroſis*, where the Blood is Thick and Torpid. On the other Hand where the Alkalious are too redundant, and unbridled, or exalted, the Blood is render'd too thin and fluid, ſo that the Diſcrimination of its Conſiſtent Parts is loſt, according to the ſeveral Degrees of which follow *Hypermenſtruations*, *Purple Spots*, *Bloody Urine*, *Sweat*, &c.

No ſincere Acid in Humane Blood.

Another Diſaffection which is very frequent in the Blood, is a too great abundance of Oils or Salt Particles, by means of which the active parts of the Blood being too much clogg'd, the Faculties of the Body are not ſo Vigorouſly exerted; and thoſe Parts, which ſhou'd be ſeparated from the Blood, for peculiar Uſes, are intangled and detain'd; whereby the ends for which they are occaſion'd by Nature to be ſeparated, are not ſufficiently anſwer'd; and perhaps, (which may be none of the leaſt inconveniencies of an over-Oily Blood) the Solid Parts, through and by which it paſſes, are too much Lubricated and Suppled, and the Tone of them thereby vitiated, and conſequently their Spring relax'd, and their Action impair'd. From hence proceed that Sluggiſh Inactivity and Drouſineſs which generally attend very Fat People, whoſe Nerves, Membranes, and other Tenſe Parts, are relax'd by the too great Quantity of Fat, with which the Blood abounds.

Blood ſometimes over Oily.

The contrary Affection to this, is, the defect of Oil in the Blood, which being, as it were, its

Or overcharged with Salt.

its Balſam, lines and preſerves all the Parts from being Fretted and Corroded by the Salts, whoſe *Spicula* or Edges are engag'd, and as it were ſheath'd in this ſoft Balſamick Matter, and ſo kept from attending the Solid Parts, as they conſtantly do where this is wanting. This *Dyſcraſy* of the Blood is uſually attended with a general *Atrophy*, and a Fretting or Corroding of ſome particular Parts: Whence ariſe Serous Defluxions, Apoſtemations and Ulcers, *&c.* to which all parts of the Body are liable in ſuch a State of the Blood, eſpecially the Lungs, whoſe tender Veſiculous Subſtance is more eaſily annoy'd than any other, by the Acrimony of the Salt *Serum.* Whenever this happens, if it be not ſpeedily corrected a *Phthiſis* ſoon follows, in the *Acme* of which the Lungs become Ulcerated.

The Quantity of terreſtrious Matter in the Blood not determinable.

Theſe are the principal *Dyſcraſies* or Diſaffections of the Blood, relating to its Temperature, and due Mixture. For as to its Terreſtrious part, or Element of Earth, the Exceſſes or Defects of that are not ſo notorious, and conſequently the proportion which it holds to the reſt, is not ſo eaſily to be diſcover'd and adjuſted, unleſs perhaps the Cretaceous *Tophi*, and Calculous Concretions ſo frequently found in Animal Bodies, may be ſaid to be the Product of a redundance of Earth in the Blood. But if that be ſo, this *Dyſcraſy* does not ſhew itſelf very apparently in the Blood, by any thing but its Effects, neither does it afford any clear Indications. For thoſe that in theſe Caſes Phyſicians have been able to find, are generally drawn from the exceſs and kinds of the Salts, which are always combin'd in great Quantity in this ſort of Concretions; and all the Scope that they rationally drive at from their Preſervative or Curative Indications, is to prevent thoſe Coagulations, of which they look upon the Salts to be the Cauſe, or to diſſolve them when but looſely form'd. For whatever farther ſome may pretend to in theſe Caſes, is but the vain Boaſtings of Charlatans and Empiricks who cheat the People with their Pretences to infallible Diſſolvents of firmly compacted Stones, which they impudently pretend to have done, whenever, by the ordinary means diſguis'd, they happen to drive out any looſe unknit Gravel, or ſmall Stones.

All the other *Dyſcraſies* of the Blood diſcover themſelves readily enough to the Eye, the Touch, or the Taſte of a diligent Judicious Inquirer. But this only betrays itſelf none of theſe Ways, and is to be found out by Reaſoning, and Conſequences drawn from Hypothetical Cauſes; in which we may eaſily be deceiv'd, tho' there be a neceſſity ſometimes of uſing them. We can eaſily ſee whether the Blood be of greater, or leſs Conſiſtence, than in a State of Health it ought to be: We can ſee and feel whether it abounds with Seroſities or Oil: And we can Taſt or even feel the Aſperities of the Salts: The Earth only which is eſteem'd the groſſeſt of all the Hypoſtatical Elements eludes all theſe Tryals, and leaves us to find it in its Effects.

However, as the Exceſſes and Defects of the other Elements, are the moſt diſcoverable, ſo are they likewiſe the moſt important; and by their various Combinations and Complications produce moſt of the Diſeaſes of the Humours of the Body; and therefore the Conſtitution of the Blood ſhou'd upon all occaſions of Phlebotomy be nicely inquir'd into with more Curioſity and Exactneſs, than I doubt Phyſicians generally uſe; who ordinarily content themſelves with a ſuperficial view, or perhaps a ſlight Taſt with the end of the Finger: Whereas they ought in many Caſes to feel carefully, and examine by their Touch the Degree of Cohæſion and Tenacity in the Grumous part after Separation, as well as the

Smoothneſs and Oleoſity of both parts: And if they did, by frequent weighing a ſtated Meaſure, examine the Specifick Gravity of Morbid in different Caſes, and of Sound Blood likewiſe; they might perhaps arrive at a Standard of the Quantity of Air contain'd in them, and thereby diſcover when the Diſeaſe proceeded from an Exceſs, or defect of Air incorporated in it. It is certain that the light, looſe Obſervations made upon Blood by our Chirurgions, and Blood-letting Apothecaries, are very ſuperficial and unſatisfactory, and the Judgments that they make upon them generally Erroneous and Falſe; for minding only the Superfice and Colour, or perhaps the appearing Quantity of *Serum*, they roundly pronounce it Good or Bad, Rich or Poor, without minding any other Circumſtances. Thus if the Colour be Florid and Gay, they readily commend it for good Blood, although perhaps it be Hypochondriacal or Flatulent, or have in it the Rudiments and Tokens of an Incipient Inflammation; in both which Caſes the Blood will be very florid, becauſe the Texture of it is pretty looſe and broken. But having heard that there were ſuch things in the Blood as Red Globules, from which indeed the *French* Phyſicians, and Philoſophers have upon the Score of the Figure generally deriv'd the Redneſs of the Blood (tho' according to the Doctrine of that Incomparable Mathematician and Philoſopher Sir *Iſaac Newton*, Red being the Colour leaſt Refrangible and leaſt Refracted, the Globular Figure, is of all others the leaſt apt to produce that Colour as being the moſt Refrangible) they conclude the Globules of the Blood ſafe and entire, and conſequently all elſe well. On the other Hand, when they ſee the ſizy Pellicle, they preſently cry out of Acidity, which cauſes in their Opinion that ſtiff *Coagulum*. Whereas it is the Product of the direct

Sizy Blood no Argument of Acidity.

rect contrary, and is only a mixture of the aqueous and Oily part of the Blood by means of too much Volatile Salt, which by an intenſe Heat are inſeparably incorporated, as appears by the ſtiff Jellies produc'd in the Digeſtor mention'd, Chap. XIII. B. I. which both in Colour, Conſiſtence and Tenacity, reſembles the Sizy Skin, which by its appearance always on the Surface ſhews itſelf to conſiſt of the lighteſt Parts of the Blood. The viſible Changes that happen beyond theſe are generally matter of Surprize, not inſtruction to them, and are uſually the Objects of their Wonder, not Judgment; which it is not to our preſent purpoſe to Proſecute here, it being ſufficient to have given a Hint to the Judicious Inquirer, whom I pretend not ſo much to inform, as to excite.

Ch. XIII. *of Digeſtion.*

Other Alterations in the Blood.

There are other Diſorders in the Blood, which do not Originally ſpring from any *Dyſcraſy* or undue mixture of its Elements, but from an Alteration in the Motion: Such as an Augmentation or Diminution of the Degree of Velocity in the Progreſſive Motion: Or the ſame Changes in the Degree of the Expanſive, by which Supernatural Fermentations are induc'd, or the neceſſary ones dampt and checkt, and the Progreſs of the Blood too much hurry'd, or retarded, which depend upon various Cauſes, very different from one another: As ſometimes on matters taken in *ab Extra*, as in Fevers and other Diſorders occaſion'd by Surfeits, Debauches or Drugs, ſometimes by too violent Exerciſes or catching Cold: At other times by ſome latent Malignity, or Indiſpoſition of the Air, from whence proceed Epidemical Diſeaſes; and very often by ſome vitious peccant Humours generated in the Body it ſelf, and reaſſum'd into the Blood, which are too many to be enumerated here, without entring into a Detail of almoſt all the Diſeaſes of the

Blood.

Ataxy of the Spirits, a groundleſs precarious ſhift. Blood. In this ſort of Diſorders the Spirits are too often accus'd, which is ſo convenient a ſhift, and ſo fitted to be employ'd on all occaſions, that it is grown almoſt the common *Aſylum* of all baffled Reaſoners; who, when they are puzzled, need do no more than lay the Fault upon the Spirits, and the difficulty is over without any trouble; for they are always at Hand to bear the Blame. But, this is explaining *Obſcurum per Obſcurius*, till ſome Body or other gives us better Demonſtration of their Exiſtence, Nature and Operations, than our Ignorance, and want of ſomething to fill their Place, and ſtop a Gap in our Philoſophy, have done.

The Solids promote the Circulation. The Solids likewiſe have their ſhare in the diſorderly Motions of the Blood, for according as the Tone of the reſpective parts, thro' which the Fluids paſs, is over-tenſe, or too lax, the Motion of the Humours will be promoted or retarded thereby. For in caſe of over-tenſion of the Veſſels, the Preſſure of the Fluids will by the Reſilition or Elaſtick return of their *Parietes* be reverberated with greater Strength, and conſequently a greater Motion will be thereby impreſſed upon them, and the Celerity of it encreas'd in Proportion. But, in a Relaxation or *Atonia* of the ſame Veſſels, the Expanſion of the Fluids, towards which they have a perpetual tendency from Cauſes already mentioned, will neceſſarily be greater from the yielding of the Veſſels; but the Progreſſive will loſe ſome of its Celerity for want of the Repercuſſion of their ſides upon the Fluids, as it does in the Veins; which Reſolution of the Tone of the Solids may be one Cauſe of thoſe Symptoms, which conſtantly attend *Epilepſies*, and other Spaſmodic Diſtempers.

Nutrition, whence. The Blood, thus variouſly compounded, and circumſtantiated, viſits even the Minuteſt Part of the Body, by means of the Circulative Motion:

Of the Impulſe and Cauſes of which, and the paſſages through which it is perform'd, an Account has been already given, which needs no Repetition here.

In this Round, thoſe Particles of the Blood which conform beſt to the Figure, and Structure of the Parts thro' which they paſs, are appoſited to them either for their Augmentation, which is called Accretion: Or for the Reparation of ſuch, as by the Conſtancy and Rapidity of the Circulatory Motion of the Blood muſt needs be worn off from them.

Conteſted by Authors.

About the matter from whence this Nouriſhment is deriv'd, great Conteſts have ariſen among Phyſicians and Anatomiſts; in which this only has been a Point agreed upon by common conſent, that among the various Humours of the Body there was one peculiarly deſtin'd and contrived for that Office, but which that is, has been the Diſpute. In which, if I may have leave to ſpeak ſo freely of great Authors, they have in my Opinion, ſhewn more Reading, Learning, and Subtilty, than true Underſtanding of the Point in Queſtion.

Various Hypotheſes

Some have contended for a Nutritious Juice to be convey'd through the Nerves, in which ſome great Men of our own Country have been the principal Miſleaders: Some have ſet up the Lymph; Others the Chyle, as the Univerſal *Succus alibilis:* Some have appointed the *Serum* or *Albumen* of the Blood, (which to intimate it once for all, I take to be the ſame thing with the Lymph) for that Office, which others aſſign to the *Craſſamentum*. And there are ſome who out of ſeveral Elementary parts of each, or all theſe, make various Combinations according to their own Fancies, from whence they have formed an almoſt innumerable variety of *Hypotheſes:* All of them carrying ſeeming Probability, yet none of them Conviction, at leaſt not to me. The Reaſon of this Miſcarriage of ſo many great Wits, ſeems not to be any want in them of Qualifications ſufficient for ſuch Inquiries, but that the Matter is in its own Nature not preciſely determinable.

Blood commonly agreed to be the Vehicle of Nutritious Particles.

However all theſe (except they who bring a Nutritious Juice thro' the Nerves) agree that the Blood is the Vehicle, that conveys the Alimentary Parts, through all the Body, whatſoever they may be, and whenceſoever deriv'd. But perhaps upon the Score of its Heterogeneity or Compoſition of different Elements, they did not make that itſelf the Nutritious Fluid without reſtraining the Faculty of Nouriſhing to ſome particular parts of it, as thinking the general Account too vague and indefinite. I muſt confeſs myſelf of another Mind, and own, that I think all thoſe preciſe Determinations to be too narrow and reſtrain'd, and that the Blood in its largeſt acceptation (including all thoſe parts which have been before deſcrib'd as belonging to it) is ſimple and homogeneous enough for the purpoſe of Nutrition.

No particular Nutritious Juice.

I conceive therefore that all the ſpecifically different parts (be they more, or fewer than thoſe we have already deſcrib'd) which circulate together in the Veſſels under the common Name of Blood; do contribute ſomething either Inſtrumentally or Materially to the Augmentation or Reparation of the Parts through which they paſs: But how much each preciſely for its ſhare does ſeparately contribute, I do not pretend to know: Nor indeed to be able to ſay, that the Liquor, which we call Blood, conſiſts preciſely and exactly of ſo many Elements or Parts ſimple, as to Senſe, and our *Analyſis*, and no more.

There-

Sanguification.

Therefore before I proceed to lay down my own Notion of Nutrition, it will be neceſſary to ſay ſomething concerning Sanguification, another Point which has been very much canvaſs'd among the Learned; but in my Opinion with as little Fruit and Satisfaction as the former. I ſhall not therefore trouble myſelf, nor the Reader with the Diſcuſſion of ſuch ſteril Queſtions, as whether the Liver, the Heart, or the Blood, *&c.* ſanguify, which ſerve rather to try the Wit and Invention of Young Students, than to inform their Judgments.

What underſtood by it.

By Sanguification is generally underſtood the Aſſimilation of the *Chyle* into Blood, which is ſuppos'd to be compleat, when the whole Circulating Maſs is ſaturated with a high Red Colour, and upon Phlebotomy ſeparates in the Baſon into a red *Craſſamentum*, and an Amber Coloured *Serum* only, without any white Matter floating looſe on the Surface, as the Chyle before perfect Aſſimilation will do.

Vain Diſputes about the Parts ſanguifying.

The Phyſicians of the laſt Century, upon the Introduction and Reception of Chymiſtry, ſuſpecting almoſt every thing in a Humane Body to be done by Ferments, and among the reſt Sanguification; were therefore very ſolicitous to circumſcribe and fix it to the proper *Officina*, where they ſuppos'd this Ferment was prepar'd, or at leaſt to be found; and great Diſputes there were among them about it. Hence the Liver and the Spleen had ſometimes their Triumphs, ſometimes their Obſequies ſung, as a freſh Champion or Adverſary aroſe for or againſt their Cauſe. But I ſhall not here trouble the Reader with any thing more particular about the Notion of ſuch ſort of Ferments, or theſe Topical Sanguifications. Neither ſhall I diſturb the Aſhes of the Plaſtick Powers and Faculties of the Antients long ſince deceas'd, ſince no Body is in danger of reviving

ving thoſe Doctrines again with any Proſpect of Succeſs.

Sanguification gradual. Firſt Degree. Of Sanguification we may admit two Degrees, the firſt of which amounts to no more than a Confuſion, or ſuch an intimate mixture of parts, as ſuffices ſo to confound the different colour'd Liquors, as that the whiteneſs of the *Chyle* ſhall be ſo loſt, or drown'd in the red Colour of the Blood, as never more to appear again in its own Shape and Colour; to which, how many Circulations are neceſſary, is hard to determine. However, he that conſiders the ſeveral Motions, as well Inteſtine as Progreſſive, will eaſily allow them ſufficient to produce ſuch a mixture in no long time.

Second Degree. The ſecond Degree of Sanguification, is when the parts of the Chyle are ſo exalted, or comminuted and ſubtiliz'd, as to loſe entirely their former tendency to a Coagulatory Separation, ſuch as in Chyle and Milk they have. In the ſpontaneous Separation, or curdling of which latter, there is a Concurrence of a manifeſt Acid, which in the Separation of the parts of Blood is never found, not even in the moſt morbid Caſe, that ever I could hear of.

Why two Degrees only mentioned. I have mentioned but two Stages or Degrees of Sanguification: One, while the Mixture is groſs and confus'd only; and the other, when the Parts are comminuted and united, which ſeems to give us a ſufficient Idea of perfect Blood; tho' there may be, and undoubtedly are, ſeveral Steps or Degrees between theſe, which we neither need, nor indeed can diſtinguiſh by any ſufficient Tokens, for want of knowing how many Circulations are neceſſary to make a perceptible Alteration in the aggregate Maſs. However, there is a farther Degree in which the parts are yet more exalted and ſubtiliz'd. But this being beyond what is ſalutary, I account the Sanguification perfect without it. This latter is that State in which the Fibres and Filaments of the Blood are ſo broken and blended with the aqueous parts, as not to be again ſeparable from 'em; which therefore I eſteem a Morbid Sanguification, ſuch as happens in Peſtilential and other Fevers, which are attended with *Bloody Sweat*, *Urine*, *Spots*, &c. and in which the Blood will not ſeparate when cool, tho' out of the Body.

Circulation the main Inſtrument of Sanguification.

All theſe Degrees, whether imperfect, perfect, or morbid, are procur'd by reiterated Circulations; in which, as well the inteſtine as progreſſive Motion, conſpires to the effecting the Mixture and Comminution of the adventitious Parts, and undoubtedly have their ſtated Period, in which they arrive at Perfection; tho' where preciſely to fix that, is unknown to us. But that it is ſo, is plain by the Crudity of the Chyle, which may be found by letting Blood after a full Meal, in which the Chyle will appear diſtinct after many repeated Circulations, and by the too great Fluidity, or over-intimate Mixture which appears in that State, which we call the morbid Sanguification; in which there is undoubtedly the Concurrence of ſome collateral Cauſe, beſides the natural Motions of the Blood; becauſe it is found in ſome peculiar Diſtempers only, tho' there may be many Degrees of Exceſs of Exaltation, beyond the due State, before it arrives at that inſeparable pitch of Fluidity which manifeſts it ſelf plainly to us; but being unheeded, and perhaps not cognizable by any viſible Token, we cannot account diſtinctly for 'em. It would indeed be of very great Service towards the Cure of Diſtempers, if ſuch adequate Trials could be invented, as might diſcover the ſeveral Gradations towards or beyond ſalutary Sanguification. But theſe being yet uninvented, muſt be left to future Induſtry and Sagacity.

Sanguifi-cation and Nutrition equally perplex'd.

By this Account of Sanguification, however rude and unaccurate, it will be obvious to any conſidering Perſon, that the ſame Difficulties that occur in ſettling the diſtinct Steps of Sanguification are to be met with in Nutrition alſo: For, whatever the nutritious Particles may be, it is plain that from the firſt admiſſion of the Chyle into the Blood, their Motion is confounded with the Motion of the Blood, and conformable to it, and conſequently that no diſtincter Account can be given.

Nutritious Matter various according to the Pores of the Parts.

Whatſoever Notions therefore ſpeculative Men may advance about the diſtinct and gradual Motions of the Nutritious Matter; and whatſoever Diſtributions they are pleaſed to make of this ſort of Matter to one part, and that to another; they exiſt in Imagination only, and admit of no Proof, nor indeed any regular Examination. For as the nutritious Juice, or Juices, are mix'd, and circulate with the Blood thro' all the Parts of the Body; all that we can diſtinctly conceive of 'em is, that as the excrementitious Parts are in their Paſſage ſeparated into ſpecifically diſtinct Fluids, by means of Glands, whoſe Pores are adapted to receive ſuch Particles only as when they come together make ſuch a peculiar Species of Fluid; as the Urine, which is ſeparated by the Kidnies, the Bile by the Liver, and the *Saliva* by the Glands about the Mouth, *&c.* So we may conclude, without offering violence to Reaſon, or ſtraining Inferences, that the Pores of the Parts to be nouriſh'd, are ſo figur'd and form'd, as to retain thoſe peculiar Particles which comform beſt to 'em. But we cannot with any Foundation pretend to tell what ſort of Particles each part retains, unleſs we knew diſtinctly likewiſe how the Pores of thoſe Parts were diſpos'd, and cou'd tell preciſely what Parts they were capable of receiving, and what only: Which is a Degree of

Knowledge I doubt no Man has ever yet arriv'd at.

The *Analyſis* indeed of the Parts does give us ſome groſs Idea of the Materials whereof they were compounded, if we ſuppoſe that the Bodies which we ſeparate, pre-exiſted in the Blood, ſuch as they then appear. But even thus we cannot carry our Speculations to any great Nicety. For all the Parts of an Animal (at leaſt of thoſe which we call perfect) yield the ſame Subſtances upon the *Analyſis*, and the difference is only in the Proportion. This holds true even betwixt the Fluids and the Solids, ſome affording more Oyl, others more Salt; ſome more Phlegm, and others more *Caput Mortuum*; which (if we allow it to be an uniform Body, ſuch as exiſted before) we may call in Earth to make up the number of Elements. But whether theſe were not form'd in the Body, by the Coalition there of Particles of Matter yet more ſimple, remains ſtill a Doubt ſo weighty, as will render all Concluſions of this kind from the *Analyſis* very precarious.

This being the beſt Guide we have, it might perhaps be better to reſt contented with ſuch a *Rationale* of Nutrition, as may fairly (without ſtraining or ſuppoſing) be deduc'd from the Mechanical Properties and Actions of the Bodies, nouriſhing, and to be nouriſhed.

Blood a compreſſible elaſtick Fluid.

Let us therefore conſider the Blood or circulating Fluid, as a compreſſible Elaſtick Body; and the Veſſels or Solids, which they permeate (at leaſt moſt of 'em) as Expanſile and Contractile, capable of being dilated and endued with a Faculty of Reſilition or Reſtitution; which Properties will furniſh us with a Mechanical Idea of Nutrition in general. For the Blood having beſides its Progreſſive Motion an Expanſive one, which it derives from the included Air; which being rarified by the innate Heat of the Body, expands with it all the Parts of the Liquor with which it is mixed, and thereby preſſing upon the ſides of the Veſſels extends and dilates their Pores, and ſo makes way for thoſe Particles of the Fluid, whoſe Figure admits of it either to ſlip through thoſe Pores, or to inſinuate themſelves into 'em; where by the reciprocal Contraction or Reſilition of that Veſſel, the Pores being again ſtraitned, they are fix'd; and ſo become a part of it, and ſupply the Loſs of thoſe other Particles, which by the continual Affriction, or rubbing of the Fluid upon thoſe Veſſels, may have been abraded; and ſo by the natural Conſequence of their Mechaniſm, the ſame Fluid may be conceiv'd to repair the Decay it would otherwiſe occaſion. I know ſome will not grant the Solids to undergo any ſuch Loſs of Parts; and conſequently will not allow 'em to have any need of Reparation or Nutrition, after they have obtain'd their full Dimenſions. But if they conſider how faſt a continual Flux of Water, which is not by infinite Degrees ſo rapid and forcible as that of the Blood, will wear even Stones; they will be hard put to it to ſhew how the Parts of the Body, which are comparatively ſo very ſoft, ſhould endure ſo conſtant and ſo violent a Flux of Humours, without decay.

Nutrition how perform'd.

In young Bodies, where the Veſſels are much tenderer, not only the ſides are ampliated by this Expanſive Motion, and their Dimenſions that way encreas'd by receiving more than they loſe; but by the Progreſſive Motion, which naturally and ſtrongly puſhes forward, and would not return but for the Bar and Check, which they receive at the Extremities of the Veſſels; the containing parts are gradually ſtretch'd in length, and by the Matter which inſinuates it ſelf every where into the Pores, are hindred from returning exactly to their firſt Dimenſions; by which means they

Why greater in young Bodies.

inſenſibly vegetate or grow; which they continue to do, till the ſupporting parts, in Bones, growing by degrees rigid and firm, admit of no farther Extenſion; and thereby put a ſtop to the farther growth of the more flexile and yielding Parts, which are ty'd to, and limited by them.

Growth how circumſcribed.

Thus the Dimenſions of the Body, as to length, are circumſcrib'd to that preciſe Stature, which it had at the time which the Bones firſt acquir'd that unyielding Rigidity. And theſe Dimenſions every Limb maintains during the reſt of Life, unleſs by Accident a Bone be broken, or by any Diſtemper ſoftned again, and render'd plyant; in which Caſe the other parts follow the Figure and Dimenſions of the Bone: As when it happens that the fractur'd Parts of a broken Bone are not rightly put together again, as it often falls out in the Bone of the Thigh; where the under part not being brought to correſpond rightly with the upper, the Weight of the Body making the upper bear downwards, they ſlip along each other, and the Leg is thereby ſhortned. The ſame thing happens without a Change of Dimenſion of the Bones themſelves, if the Head of the Thigh-Bone be turn'd out of its Socket in the *Iſchium*; in which Caſe the weight of the Body makes the Trunk bear downwards, and the Fleſh yielding for the head of the Bone to riſe, the Leg appears ſhortned.

What it is that determines the yielding of the Bones to a ſtated time, pretty nearly agreeing almoſt always in all Perſons, is hard to tell. All that appears certain in it, is, that this Rigidity of the Parts come on gradually, and that from our firſt Conception to that time, the Encreaſe is by degrees leſs and leſs every Year; perhaps every Month, every Day, were we able to adjuſt our Obſervations ſo nicely as to calculate it.

I am not ignorant that many times the growth receives a Check from ſome contingent Circumſtances, of which we are not aware; and returns again when they ceaſe, tho' inſenſibly to us. In Diſeaſes we are indeed aware of this ſometimes, and think we know what to impute it to, tho' even that we cannot do preciſely.

Fluids more tender in young Animals than old.

But it is not the ſolid Parts only that are tenderer in young Animals than in grown ones; but the Fluids themſelves are much more ſoft, and as it were gummous, as we find by that Juice which we call the Gravy, which the younger the Meat is, the more gelatinous it is.

Whence this happens.

This ſeems to ſhew, that from whatſoever Element they are deriv'd, or however compounded, the nutritious Parts are fibrous, ſoft and gelatinous; and that conſequently the leſs they are comminuted and ſubtiliz'd, the fitter they are for Nouriſhment. Hence it comes that the Blood of Children, having undergone few Circulations in proportion to grown Perſons, is in the ſame Proportion more nutritious, and the Parts which are form'd out of it more ſoft, flexible and yielding; which Softneſs, by length of Time and repeated Circulations, the Fluids as well as Solids gradually loſe, till the latter reſiſting the Impulſes of the Blood, a ſtop is put to their Growth.

Bones whence form'd.

From hence alſo we may conclude, that Bones are form'd out of the moſt comminuted or broken Parts of the Blood, ſince we ſee that the Blood of old Men, which by a long courſe of Circulation becomes in a manner even unfit for the common courſe of Nutrition, will however generate Bones, and convert into that ſort of Subſtance many of the Tendons and Ligaments, and even the Coats of the Veſſels themſelves; whoſe Subſtance being next to the Bones the moſt compact, admits only of the ſmalleſt Particles of the

Blood, which therefore ſooneſt become oſſeous, as they are frequently found.

Dr. Sydenham's *Problem conſider'd.*

This Theory may furniſh us with a reaſonable Solution of that Problem which Dr. *Sydenham* propounds as unanſwerable, and as an Argument againſt the Uſe of Theory in Phyſick; why a Horſe, or any other Animal, arrives at his *Acme*, meaning his full Strength and Vigour, at a determinate Age; for tho' we cannot tell by what Proportions and Degrees this Softneſs both of the Humours and ſolid Parts wears off; yet we find that it gradually does ſo, and that all ſorts of Animals have a ſtated Period of Time, in which the Circulations have reduc'd the Solids to ſuch a State of Reſiſtance, as to admit no longer of a Vegetative Encreaſe; and that gradually as this Vegetation declines, the Strength encreaſes; which depends upon the Reſiſtance that the Solids make to the Fluids, in which conſiſts the Strength of Muſcles. For the Action, or Force of a Muſcle, conſiſting in the Reſiſtance which the Muſcular Fibres make to the Effervеſcence of the Blood, or other Fluid included in the Belly of the Muſcle; the Animal is then ſtrongeſt, or in his greateſt Vigour, when his Muſcles are able to make the ſtouteſt Reſiſtance; which is when they will no longer admit of a permanent Diſtention, that is, when they have done growing.

It may be objected, that the Reſiſtance of the Veſſels is yet greater in aged Perſons, and that according to this Theory it muſt be ſo; which notwithſtanding is attended with Stiffneſs, want of Strength, Vigour and Heat, which is confeſs'd.

But theſe things depending (as has been already ſhewn) upon the mutual Action or Re-action of the Fluids and Solids upon each other; as the ſolid Parts grow ſtubborn and unyielding to the

Impreſſion of the Fluids; ſo they loſe their Elaſticity, or Faculty of Reſilition, or Reſtitution, by which the Motion of the Blood it ſelf was invigorated and promoted; and by this Rigidity of the Veſſels the Blood is reduc'd to a mere circulatory Motion, ſuch as is impreſs'd by the Impulſe of the Heart only, without any room for the Expanſive; upon which all the vital Actions depend, as much (at leaſt) as upon the Progreſſive, though both be indiſpenſibly neceſſary.

But, beſides this Indiſpoſition of the Veſſels, (which from the Theory laid down, unavoidably attends Age) the Humours themſelves, by long Attenuation, grow ſo much aſſimilated or homogeneous, that the Fermentation, or neceſſary Expanſive Motion, is but ill maintain'd; through which Defect, together with that of the Veſſels, the Circulation it ſelf languiſhes, and all the vital Faculties gradually decay with it; till, if no Accident ſupervenes to haſten Death, which a little one in theſe Circumſtances will do, Nature it ſelf fails, and they drop, like over-ripe Fruit, as it were, ſpontaneouſly and of courſe, into the Grave.

The Theory (as little able as we are to be preciſe and exact in it) will enable us to account for more *Phænomena*, and is capable of more improvements, than any drawn from particular Humours, without any Force upon Nature, and running into Suppoſitions not warranted by the Mechaniſm of the Body. But, if it be (as I think) true, it ſuggeſts a way of preſerving our ſelves longer than ordinary, if regular and early Care were taken; of which having no room to ſpeak here, I ſhall reſerve it to a farther Opportunity, and in the mean time leave it to the Conſideration of others.

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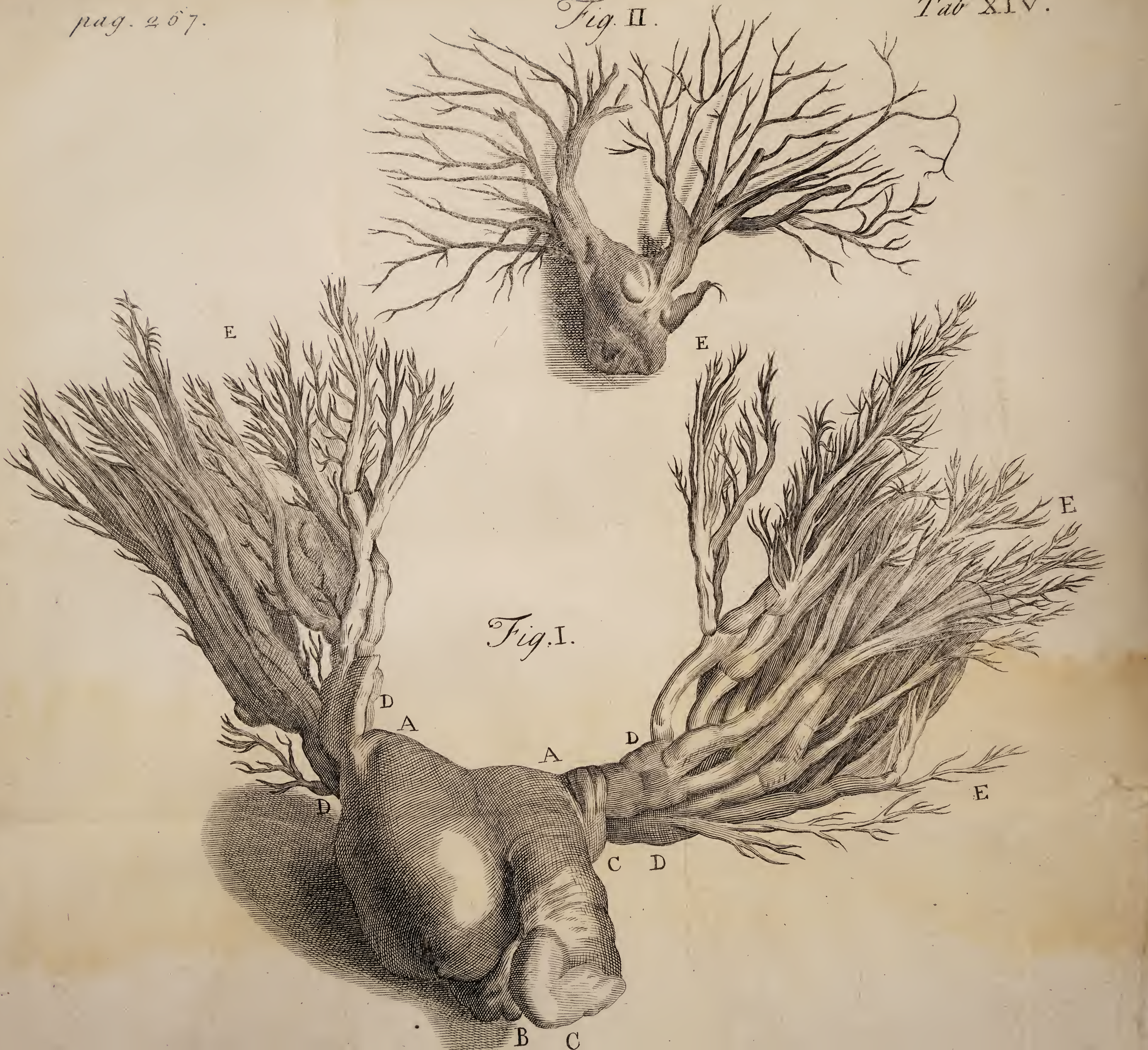
Tab XIV.



TAB. XIV.

FIG. I.

THE Pulmonary Vein, with the Branches nearer each other, as in Expiration.

N. B. The ſame Letters of Reference with the preceding table, explain this likewiſe.

FIG. II.

A *Polypus* taken out of this Vein anſwering its largeſt Ramifications.

◆

A
NEW SYSTEM
OF
ANATOMY.

BOOK III.
Of the HEAD.

CHAP. I.
Of the containing Parts of the HEAD.

OF the containing Parts of the HEAD, ſome are common, ſome proper.

The common are the ſame with thoſe of the reſt of the Body, which are the *Cuticle*, *Cutis*, *Membrana Adipoſa* and *Panniculus Carnoſus*.

Skin. The Skin itſelf is various in different Parts of the Head. On the Scalp, eſpecially the hinder of it, call'd *Occiput*, it is very thick and hard, on the Face it is thin, ſoft and ſmooth, but on the Lips thinneſt of all.

Fat. There is very little Fat about the Head.

The *Panniculus Carnoſus* is plainly Muſcular in the Fore-head of ſome, by means of which they move the Skin of the Forehead as they will. Others, in whom the Occipital and Frontal Muſcles join their Tendons, can move the whole Scalp of the Head. Panniculus Carnoſus.

On the outſide of the Head, out of that Part which is call'd the Scalp, ſpring the Hairs; which though many have taken a great deal of unneceſſary pains to exclude from the Number of the Parts of the Body, yet being the Product of it, and containing ſomething very curious in their Structure, are worth a ſhort Account. They are obſerv'd by the Microſcope to be hollow, and furniſh'd with a multitude of Veſſels; and however to us they appear to be ſimple and equal, the Microſcope ſhews them to be knotted like ſome ſorts of Graſs, and to ſend out Branches at the Joints. Their Cavity has been otherwiſe prov'd by the Diſtemper called the *Plica Polonica*, in which the Blood itſelf has dropt through the Hairs. But I have never ſeen this Caſe, and am apt to doubt, whether the Blood that Iſſues be not ſent from other Veſſels, and only runs externally from the Hair to the extremity. *Hair.* *Cavity.*

As for the Branching of the Hair 'tis pretty viſible at the extremities, without a Microſcope, for it is very apt to ſplit (as the Hair-Cutters call it) eſpecially if it be worn long and kept dry. This diviſion of the extremity, (which to the naked Eye ſeems to conſiſt but of two or three Hairs) by the Microſcope appears to be a Bruſh of Hair. *Branching*

Each of theſe Hairs has a little Bulbous or Oval Root in the Skin, which ſometimes adheres to it, ſo as to be pluck'd away with it. *Root.*

They are commonly reputed an Excrement, and eſteem'd to be Nouriſh'd by ſuch. But, whatever the matter of their Nouriſhment is, it *Nouriſhment.*

ſeems to be more ſimple than the other Humours of the Body. For long after Death, when all the other Parts and Humours, are putrefy'd and corrupted, the Hair will vegetate and encreaſe, which it appears to do ſo long as any moiſture remains in the Part.

Proper containing Parts. The proper containing Parts of the Head are ſtrictly in Number but two, the Muſcles, and the Membranes: Of the firſt of which we ſhall ſpeak hereafter in its proper place.

Membranes. Some make two containing outward Membranes, the *Pericranium* and *Perioſteum*, which are in reality but one double Membrane conſiſting of two Coats, as moſt others do; of which the exterior is by ſome, by a diſtinct Name, call'd *Pericranium*, and the inner *Perioſteum*, as lying immediately upon the Bone. *Connexion.* This Membrane is pretty firmly connected to the *Dura Mater* by ſeveral Fibres tranſmitted from it to that Membrane through the Sutures of the Skull.

Diviſion. About the Temporal Muſcles, theſe two Membranes part, the outer going over the Temporal Muſcles, and the under remaining ſtill cloſe upon the *Cranium*. Which Diviſion, though common to the Proceſſes of divers other Membranes, has occaſion'd their being reckon'd diſtinct, and diverſify'd by two Names.

Cranium. The *Cranium* may be reckon'd the Baſis of the Head, and therefore not to be reckon'd among the Parts ſimply continent. But of that, likewiſe, more in another place.

CHAP. II.

Of the MENINGES *or* MEMBRANES *containing the* BRAIN.

Way of opening the Skull.

IN order to the Diſſection of the Brain, the Skull muſt be ſawn through the middle of the Temporal Bones, and of the Bone of the Forehead, and through the upper part of *Os Occipitis*; which being carefully done, ſo as not to wound the Membranes lying under them, the Skull muſt be gradually heav'd up with a Lever. The top of the Skull being thus looſen'd from its Baſis, by a ſudden Jirk at the *Os Frontis*, it will be ſucceſsfully freed from the *Dura Mater*, that adheres very cloſe to it by Fibres and ſmall Blood-Veſſels which perforate the Skull, eſpecially at the Sutures.

Order of the appearance of the Parts of the Brain, &c.

The Skull being open'd, firſt the Membranes containing, then the Brain, next the *Cerebellum*, and laſtly the *Medulla Oblongata*, with all their Veſſels preſent themſelves to the view.

Meninx Craſſa.

Immediately under the Skull, lies a thick tough Membrane, call'd *Meninx Craſſa*, or *Dura Mater*, which covers the whole Subſtance of the Brain, and Spinal Marrow, and affords likewiſe a Coat to the Trunks of the larger Nerves.

Connexion.

It is connected on the upper-part to the *Perioſteum*, by means of Fibres (already deſcrib'd) which paſs through the Sutures from one to the other. On the under-ſide it is ty'd to the *Pia Mater*, by the Branches of the *Sinuſes*, and by the Arteries and Nerves.

Coats.

This Membrane conſiſts of two Coats: The Exterior hard, dry, and ſomewhat rough: The Inner more ſmooth, ſoft and moiſt. It deſcends double between the two Hemiſpheres of the

Brain, which it divides, as deep as the *Corpus Calloſum*, and by reaſon of its Curvature occaſion'd by the Convexity of the Brain, it is in that part call'd *Falx*, from the ſimilitude which it bears to a Sickle. It likewiſe inſinuates itſelf between the Brain and *Cerebellum*, and by that means hinders the Brain from lying too heavy upon the *Cerebellum*.

Falx.

Sinus.

In theſe Duplicatures are ſeveral Cavities call'd *Sinuſes*, which are a ſort of Venous Channels form'd for the re-conveyance of the Blood, and plac'd between the Duplicatures of this Membrane. Of theſe, Four only are conſiderable.

Longitudinales. Fig. i.

The Firſt of theſe call'd ordinarily *Sinus Longitudinalis*, runs along the middle of the Convex Part of the Brain from the *Criſta Galli*, to the hinder part of it, where it is divaricated, ſending out on each ſide between the Brain and *Cerebellum* a Branch, which are call'd the Lateral *Sinuſes*; and beſides a third Branch which deſcending through part of the Subſtance of the Brain to the *Glandula Pinealis*, terminates in the *Torcular Herophili*, which is form'd out of the Concourſe of this and the Lateral *Sinuſes*. This *Sinus* is much leſs than the reſt. Beſides theſe *Sinuſes*, there are divers others on the Baſis of the Skull, on the *Oſſa Petroſa*, and round the *Sella Turcica*, which are conſtant and uniform in moſt Bodies: Though Nature ſports as well in theſe as in the Veins of other parts of the Body, which therefore ſcarce deſerve our pains to be very particular in.

Laterales.

Torculas Herophili.

Sinuſes *whence form'd.*

All theſe *Sinuſes* are form'd out of the ſeveral Venous Branches, which return the Blood from the Brain and *Cerebellum*, and deliver their Contents into the Jugular Veins, of which they are, as it were, the Roots from whence they ſpring.

The Coats of theſe *Sinuſes*, (eſpecially about the Divarication) are furniſh'd with many ſtrong Fibres ſeemingly Nervous, by means of which, as they are dilated by the Influx of the irruent Blood, ſo they are contracted again, and by their alternative Dilatation and Contraction, create a reciprocal Motion, like the Pulſe of an Artery. *Motion.*

Immediately under this Membrane, lies another very fine, tranſparent one, from its extream Thinneſs and Fineneſs compared to a Spider's Web, and call'd *Arachnoides*, which between the *Dura* and *Pia Mater*, covers the whole Subſtance of the Brain. But this ought to be look'd on no otherwiſe than the External *Lamina* of the *Pia Mater*, which ſends its Internal *Lamella* between the Folds of the Cortical part of the Brain. Arachnoides, *the Exterior* Lamina *of the* Pia Mater.

Under this, immediately upon the Brain, lies the *Meninx Tenuis*, or *Pia Mater*, which is alſo a thin, fine *Membrane*, adhering ſo cloſely, and inſinuating itſelf into all the Folds of the Cortical part of the Brain, that it is ſcarce to be ſeparated from it. This Membrane covers the whole Brain, *Cerebellum*, and *Medulla Oblongata*, and ſerves (together with the beforementioned) for the Defence of the Brain, and ſupport of its Veſſels. Pia Mater. Fig. iii.

CHAP. III.

Of the BRAIN.

THE BRAIN (in the vulgar Acceptation) comprehends the whole Contents of the Skull, but in the Senſe of Anatomiſts, is reſtrained to that large Globous Part, which fills only the fore and upper part of it; the hinder *Brain.* *Diviſion.*

part being poſſeſs'd by the *Cerebellum*, and the under by the *Medulla Oblongata*.

Hemiſpheres *of the Brain.*

The Brain (ſtrictly ſo call'd) is divided by the Duplicature of its Membranes into two equal parts, commonly call'd *Hemiſpheres*, though the Brain it ſelf in this reſtrain'd Acceptation, be far enough from an exact Spherical Figure.

Subſtance.

Cortical.

The Brain conſiſts of two ſorts of Subſtances, one of a Cineritious or Aſh Colour, which being the exterior, is call'd the Cortical Part, which *Malpighius* by his Microſcopes has diſcover'd to conſiſt of innumerable minute Glands, of various Sizes and Figures, intermixt with abundance of exceſſive fine Blood-Veſſels. This Part, by means of the Fiſſures and Sinuoſities of the Brain, ſeems to enter deep into the Subſtance, though in reality it does not ſo, and reaches but the depth of half an Inch or thereabouts, unleſs where the *Anfractus* or Diſcontinuations ſeem to to let it in.

And Medullary.

The inner part, which is more ſoft, and very white, is call'd the *Medulla*, and is ſuppos'd to conſiſt of infinitely fine, ſoft Tubes, which receive from the Cortical, or Glandulous Part, the Fluid, which it ſeparates, and by means of the Nerves, (which are only Productions of this Part) diſtributes it all over the Body.

Corpus Calloſum.

As ſoon as the Membranes are remov'd (which is no eaſy Task upon the Account of the ſtrict Adheſion of the *Pia Mater*, which is ſcarce ſeparable till the Brain begins to putrefy, unleſs it happens to be a ſort of an Hydropical Brain, abounding with Serous Humours). Between the *Hemiſpheres* of the Brain, under the *Sinus Longitudinalis*, appears a white Subſtance of a Texture, ſomewhat more compact than the reſt of the Medullary part of the Brain, call'd therefore *Corpus Calloſum*, which runs along the whole Tract of the *Falx*, and receives from each ſide

the

the Terminations of the *Medulla*, which is interſpers'd between the ſeveral Windings or Convolutions of the Cortical Part, and is ſuppos'd to be a ſort of *Baſis* or ſupport to it.

Fornix.

At the Extremity, next the *Cerebellum*, it ſends out two Proceſſes, or Legs, by the Juncture of which is conſtituted that Body which is call'd the *Fornix* or Arch.

Septum Lucidum.

Underneath this *Fornix* is found a thin tranſparent Subſtance, differing from the *Fornix* or *Corpus Calloſum* it ſelf, only in its Tenuity and Diaphaneity. From the *Fornix* it is continued all along under the *Corpus Calloſum*, dividing the two great Cavities, or Lateral Ventricles of the Brain from each other. This Body is call'd the *Septum Lucidum*.

Ventricles Four, Lateral Two.

Rima.

Fourth Ventricle.

In each *Hemiſphere* of the Brain is a pretty large Cavity, which are call'd the Lateral Ventricles. Beſides which, juſt under the *Fornix*, as it were, between the Bifurcation of it, is another Cavity, call'd the *Rima*, which though abundantly leſs than either of the other, is reckoned as a Third Ventricle. And between the *Cerebellum* and the *Medulla Oblongata*, is a Fourth; which are call'd the Four Ventricles of the Brain.

Corpora Striata.

In the Lateral Ventricles on each ſide, appear the *Corpora Striata*, and the *Alæ* of the *Plexus Choroidalis*, which belonging to the *Medulla Oblongata*, and the Blood-Veſſels, ſhall be deſcribed in their proper places.

T A B. XV.

SHews the Baſis of the Brain, and part of the *Medulla Oblongata*, with the Blood-Veſſels injected with Wax.

A A, The fore Lobes of the Brain.

B B, The hinder Lobes.

C C, The *Cerebellum*.

D D, The Lateral *Sinus*'s.

E E, The Vertebral Arteries, as they run between the firſt *Vertebra* and Bone of the *Occiput*.

F, The *Vertebral Sinus*.

G G, The *Dura Mater*, on the right ſide, taken off from the Spinal Marrow, but remaining on the left.

1, 2, 3, 4, &c. Ten Pair of Nerves belonging to the Brain, and the firſt Seven of the Spinal Marrow.

a, The *Foramen* opening from the *Infundibulum* into the Pituitary Gland.

b b, The Two white Protuberances behind the *Infundibulum*.

c c, Two Trunks of the Carotid Arteries, cut off where they began to run betwixt the fore and hinder Lobes of the Brain.

d d, Two Arteries joyning the Carotids, with the Cervical Artery, call'd the Communicant Branches.

e e, Two other large Branches of the Cervical Artery, which help to make up the *Plexus Choroides*.

f, Branches of the Carotid Artery.

g, The Cervical Artery, compos'd of the Two Trunks, h h, of the Vertebral Arteries, which here runs along the Annular Protuberance ſomewhat contorted, as in other Subjects ſtreight, and others yet more contorted.

h h, Two Trunks of the Cervical Arteries, lying on the *Medulla Oblongata*.

i, The Spinal Artery.

k k, The Spinal acceſſory Nerve.

l l, The *Crura* of the *Medulla Oblongata*.

m m, The Annular Protuberance or *Pons Varolii*.

n, That part of the *Caudex Medullaris* on the right ſide, call'd by *Willis* and *Vieuſſens*, *Corpora Pyramidalia*.

o, That part on the ſame ſide call'd *Corpus Olivare*.

p, The fore-branch of the Carotid Artery, which divides the Interior Lobes of the Brain.

q q, Other little Branches of Arteries, which help to conſtitute the *Plexus Choroides*.

r r r, Branches of Arteries from the Cervical Artery, diſpers'd through the Annular Protuberance.

s s, Part of the Second Proceſs or Peduncle of the *Cerebellum*.

*, A ſmall Branch of an Artery, paſſing between the *Fibrillæ* of the Ninth Pair of Nerves.

CHAP.

Tab. XV

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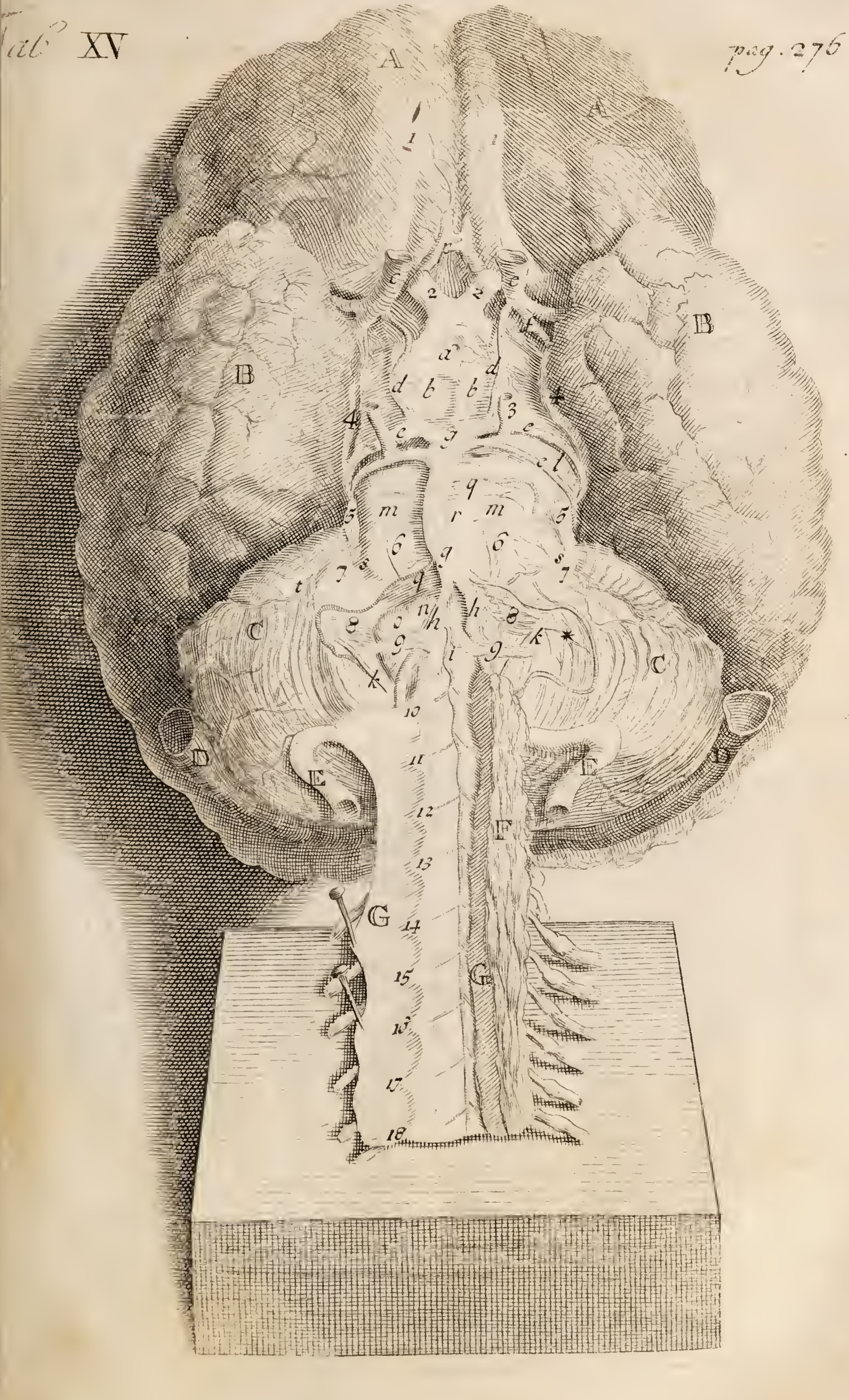

CHAP. IV.

Of the MEDULLA OBLONGATA, *its Nerves, Blood-Veſſels, and other Appendices.*

Medulla Oblongata.

THE MEDULLA OBLONGATA is the *Medullary* part of the *Cerebrum* and *Cerebellum.* The fore-part of it from the Brain, the hinder from the *Cerebellum.* It lies upon the Baſis of the Skull, and is continu'd thro' the great Perforation of it into the hollow of the *Vertebra* of the Neck, Back, and Loins. But, after its *Exit* from the Skull, it is call'd by another Name, viz. *Medulla Spinalis.*

Crura.

Pedunculi

It ariſes, as it were, from four Roots, of which the two largeſt ſpring from the Brain, and are call'd CRURA: The two leſſer from the *Cerebellum*, which have been nam'd PEDUNCULI by Dr. *Willis.*

Subſtance.

The Subſtance of the *Medulla Oblongata*, ſeems to be purely nervous, and to be only an aggregate of thoſe ſmall fine Tubes, thro' which the Spirits are ſuppos'd to paſs.

Protuberantia Annularis.

To examine this part of the Brain regularly, it ought to be inverted; and then firſt appears upon the Trunk of it a Protuberance, in form almoſt like a Ring, which has therefore been call'd, by Dr. *Willis*, *Protuberantia Annularis.*

Nerves, ten Pair.

Olfactory.

But in the taking the Brain out of the Skull, the ten Pair of Nerves, which come immediately from the Brain, are beſt ſhewn. For by firſt raiſing the fore-part of the Brain, juſt below the *Os Frontis*, the OLFACTORY NERVES come in view, which being pretty thick near the *Os Cribroſum*, are there call'd *Proceſſus Papillares*, which is (in my Opinion) a properer Name than that of Olfactory Nerves, in that Place; becauſe they ſeem rather to be Productions of the *Me-*

dulla Oblongata, from which the Olfactory Nerves ariſe, than diſtinct Nerves, againſt which their manifeſt Cavities, and their Communication with the Ventricles, argue.

Branches of the Carotid Arteries. Immediately behind theſe Nerves appear two ſmall Arteries, which are Branches of the *Carotides.*

Optick Nerves. The next Pair are the OPTICKS, which, ariſing from the *Crura* of the *Medulla Oblongata* on each ſide, come together, above the *Infundibulum*; and after parting again, go each of them to the Eye, on the reſpective ſide from whence they ſpring. This Concurrence has laid the Foundation of an Error, (in ſome Anatomiſts) that they decuſſate one another, and that each of them ſerves the Eye of the ſide oppoſite to that from which they have their Original.

Do not decuſſate each other.

Infundibulum. The Optick Nerves being cut off, the INFUNDIBULUM appears juſt under them, which ends in the *Glandula Pituitaria*, and on each ſide of it the Carotid Arteries enter the Skull, thro' the *Os Cuneiforme.*

Oculorum motorii. Next to theſe are the OCULORUM MOTORII, which ſhooting out of the *Baſis* of the *Medulla Oblongata*, beyond the *Infundibulum*, proceed forward to the Eyes.

Pathetici. The fourth Pair, which are very ſmall, are by *Willis* call'd PATHETICI, by others *Amatorii.* Theſe have their Roots in the upper part of the *Medulla Oblongata*, near the *Cerebellum*, and paſs thro' the ſame Perforations with the former Pair to the Eyes.

The fifth Pair. The fifth Pair, which is the largeſt of any that come directly from the Brain, conſiſts of a Coaleſcence of divers ſmall Nerves, which ſpring from each ſide, from the fore-part of the *Proceſſus Annularis*, and is again, before its *Exit* from the Skull, divided into two or three Branches, which go out of the Skull at ſeveral Perforations.

The ſixth Pair.

The ſixth Pair ariſes likewiſe from, or near the *Proceſſus Annularis*, on the hinder-part, where the *Proceſſus* ſeems not to be abſolutely continu'd, and therefore it may be accounted to ariſe from the *Medulla*. It paſſes out of the Skull, thro' the ſame Holes with the *Oculorum Motorii*. Both theſe Pair, becauſe they ſend ſome Branches to the Tongue, are call'd *Guſtatorii*.

Guſtatorii.

The ſeventh Pair, or Auditorii.

The ſeventh Pair are the AUDITORY, which ariſe from the *Medulla Oblongata*, near the Place where the *Proceſſus Annularis* ſhould be, if it were entire. It paſſes out of the Skull thro' the Perforations of the *Os Petroſum* in two Proceſſes: One of which is ſoft and ſpongy, which goes to the Labyrinth and *Tympanum* of the Ear; the other, which is more compact and hard, to the Tongue, and other Parts of the Face.

The eighth Pair, or Par Vagum.

The eighth Pair, or PAR VAGUM, ariſe laterally from the *Medulla Oblongata*, a little below the former, and paſs out of the Head between the *Os Occipitis* and *Petroſum*, thro' the ſame Perforations that the *Sinus Laterales* of the *Dura Mater*, or Branches of the Jugulars do. It is join'd by a Branch of the acceſſory Nerve from the *Medulla Spinalis*, and by a Twig of the hard part of the Auditory.

The ninth Pair.

The ninth Pair ariſe from the middle part of the *Centrum Ovale*, between the *Corpora Pyramidalia* and *Olivaria* of the *Medulla Oblongata* by three or four ſmall Twigs, and go out of the Skull near the *Proceſſus* of the *Os Occipitis*; and ſend their Branches to the Tongue, as well to the Papillary as Muſcular part of it, and likewiſe to all the Muſcles that ſerve for the Motion of the Tongue: From whence theſe Nerves have been call'd *Linguæ Motorii*, tho' they cannot juſtly be excluded from the Name of *Guſtatorii* likewiſe, as they concur in that Office with the Branches of the fifth and ſixth Pair.

The tenth Pair. The tenth, which is the laſt Pair, (even with thoſe that will allow it to belong to the Brain) ariſes by two or three Branches from the *Medulla Oblongata*, juſt below the *Corpora Pyramidalia* and *Olivaria*, or rather at the beginning of the *Medulla Spinalis*; from whence reflecting a little backwards it goes out of the Skull, between the firſt *Vertebra* of the Neck, and the *Proceſſus* of the *Os Occipitis* of the ſame Orifice; through which the Vertebral Arteries enter, and is ſpent upon the external Muſcles of the Head and Ears.

Authors have differ'd about the Number of Nerves that have their riſe within the Skull, and this latter Pair is yet by many excluded from that Number. But this is a Controverſy of no great Importance. Their Difference, about the Diſtribution of them, is more material. Of that we ſhall have Occaſion to ſpeak more largely hereafter.

Lateral Ventricles of the Brain, how to be examin'd. The Brain being cleared from the Skull, and the Original and Paſſage of the Nerves regularly trac'd; it will be proper to lay the Brain upon the *Baſis*, and return to the Lateral Ventricles: In which we ſhall find two Prominences on each ſide, one Pair call'd *Corpora Striata*, being the Extremities of the *Crura* of the *Medulla Oblongata*, the other *Thalami Nervorum Opticorum.*

Corpora Striata. The CORPORA STRIATA, are a Medullary part call'd *Striata*, only from the viſible appearance of nervous Fibres, immediately upon the abraſion of the Membrane, and Surface of them. *Situation.* They lie in the fore-part of the Ventricle, and are of a Lenticular Figure, ſomewhat bigger, and approaching to each other at the fore-end, than the hinder, which point laterally, and are not only narrower but farther diſtanc'd from one another.

They are joyn'd together by the tranſverſe Medullary Proceſs. The external Subſtance of them is Cortical or Glandulous, as the ſuperficial part of the reſt of the Brain is, tho' it be not here ſo deep. The inward is that ſtrip'd Medullary part from whence they take their Name, which upon ſcraping is very plain.

Subſtance.

Betwixt theſe two is that Medullary Body which is call'd the FORNIX, which is a broad thin Production of the *Medulla.*

Subſtance of the Fornix.

A little below theſe *Corpora Striata* lie two other Prominences, call'd THALAMI NERVORUM OPTICORUM, becauſe the Optick Nerves have their Riſe from them. Theſe, contrary to the former, have their external part or Surface next the Ventricle, Medullary; and their inner Cineritious or Cortical.

Thalami Nervorum Opticorum.

On either ſide of theſe Protuberances is to be ſeen a ſmall *Plexus* of Blood-Veſſels, call'd PLEXUS CHOROIDES; conſiſting of a great many minute Ramifications of the Veins and Arteries, with ſmall Glands interſpers'd, among which ſome pretend to find Lymphaticks; the Exiſtence of which is much eaſier from Reaſon to be imagin'd, than to be demonſtrated to ſight.

Plexus Choroides.

Underneath the *Fornix* is a ſmall Cavity, opening with a very narrow Aperture, call'd the RIMA, into the *Infundibulum.* This, as we have already obſerv'd, is call'd the third Ventricle of the Brain.

Rima.

At the bottom of this Cavity, juſt below the Coalition of the Optick Nerves, lies the INFUNDIBULUM, which ſeems to be nothing elſe but a Paſſage continued from this third Ventricle to the *Glandula Pituitaria*, between the Medullary Parts of the Brain, and lin'd with the *Pia Mater*; and therefore not ſo properly to be look'd upon as a Veſſel, but as an out-let for Seroſities; though this *Glandula Pituitaria*, to which it is continu'd,

Infundibulum.

ſeems no proper Drain for 'em, however it may have been eſteem'd hitherto.

Underneath the *Infundibulum*, in that *Sinus* of the Skull which is call'd *Sella Equina*, or *Turcica*, upon the *Os Cribroſum*, is ſituate the GLANDULA PITUITARIA; ſo call'd from its ſuppos'd Office of receiving and diſcharging the ſerous Humours evacuated by the Ventricles of the Brain. But tho' the Uſe of this Part, as of divers others about the Brain, does not plainly and diſtinctly appear to me; yet I cannot admit of this Uſe, both becauſe it is againſt the Office of a Gland to receive Humours already ſecreted, which a Veſſel of a more ſimple Structure might more readily and eaſily perform; and becauſe it is the peculiar Office of Glands to ſeparate Humours before unſecreted; which two Uſes imply a direct Repugnance not to be reconcil'd. But beſides the Structure of this Gland, which is firmer than any other of the Body, makes it abſurd to think that it ſhould, like a Sponge, ſuck up Humours, not only in Contravention to its own Uſe as a Gland; but likewiſe in violence to its own Structure, which is more compact than that of other Glands, eſpecially of thoſe of the Brain. I do therefore imagine that it does, as other Glands, ſerve to ſecrete ſome Humour or other, tho' to what purpoſe is not ſo apparent. This Gland is very ſmall in human Bodies, but in Brutes much larger; which difference may, at ſome time or other, ſuggeſt to a Man of happy Sagacity ſomething concerning the true Uſe of it. It is cover'd with two Coats from the *Meninges* of the Brain.

Glandula Pituitaria

Its Uſe not certain.

Not to receive Humours already ſeparated.

This Gland larger in Brutes than in Men.

Has two Coats.

Surrounding this Gland, in the *Sella Turcica*, is a ſmall *Plexus* of Veſſels, call'd RETE MIRABILE; which is either not exiſtent in Men, or ſo very minute, that its Exiſtence is fairly doubted. In Brutes it is conſpicuous enough, and by

Rete Mirabile.

Willis is ſaid to conſiſt of Arteries, Veins, and Nerves; by *Vieuſſens*, of Arteries only; and by others, of Arteries and ſmall Veins. This is a Controverſy not eaſy to be decided, and ſcarce worth the trouble. All that appears certain is, that it conſiſts mainly, if not wholly, of ſome Ramifications of the Carotid and Vertebral Arteries.

Anus.

On the hinder part of the third Ventricle, or Cavity, is a ſmall *Foramen*, or Hole, leading to the fourth Ventricle in the *Cerebellum*. This Cavity is call'd the ANUS.

Glandula Pinealis.

At the Mouth, or Orifice, of this Paſſage, is ſeated a ſmall Gland, which, from its fancy'd reſemblance in form to a Pine-Apple, has been call'd CONARIUM, or GLANDULA PINEALIS, which *Deſcartes*, and ſome of his Followers, have extravagantly enough imagin'd to be the Seat of the Soul.

Nates & Teſtes.

On the back-ſide of the *Medulla Oblongata*, about the Stem of it, near the *Cerebellum*, appear four Protuberances or Eminencies, of which the upper Pair, which are the larger, are call'd NATES; the under and leſſer, TESTES. The Subſtance of both theſe is Medullary. The latter are over and above cover'd with a *Plexus* of Blood-Veſſels.

Calamus Scriptorius.

Betwixt theſe and the Proceſſes of the *Cerebellum*, to which they are join'd on the ſides, is a Cavity making a hollow in the middle, which is the fourth Ventricle, and has from its Figure been call'd CALAMUS SCRIPTORIUS.

Corpora Pyramidalia and Olivaria.

Beſides thoſe before mentioned on the *Medulla Oblongata*, near the Extremity of it, are four other Prominencies, two on each ſide, call'd CORPORA PYRAMIDALIA and OLIVARIA. The firſt ſituate in the middle of the *Baſis* of the *Medulla*, juſt below the *Proceſſus Annularis*, contiguous to each other: The latter on each ſide of the former. Theſe Names were given them from their ſuppos'd Reſemblance.

CHAP. V.

Of the CEREBELLUM.

Cerebellum. THE CEREBELLUM, (ſo call'd from its diſtinction from the Brain, both in Size and Situation) has been look'd upon as a little Brain by itſelf; and is placed in the hinder and lower part of the Skull, underneath the hinder part of the Brain.

Subſtance. It conſiſts, as the Brain does, of a CORTICAL and MEDULLARY Part; the ſeveral Branches of which latter, reſemble, when open'd, thoſe of a Tree, and meeting in the middle, form a kind of a Stem which runs quite through it.

Superficies. Its Surface is unequal, but not ſo gyrous or winding as that of the Brain, but looks rather as if it were laminated like ſome ſort of Shells; the middle Circles being the largeſt, and the deepeſt growing more plain by degrees, till it terminates at length on each ſide of the *Proceſſus Vermiformis*, ſo call'd from its reſemblance of a Worm. Proceſſus Vermiformis.

As in the Convolutions of the Brain, a Duplicature of the *Pia Mater* is inſinuated betwixt each of them; ſo 'tis here likewiſe between the *Laminæ*, tho' not, by much, ſo deep, as in the Brain.

The *Cerebellum* is joyn'd to the *Medulla Oblongata*, by two Medullary Proceſſes, nam'd by *Willis Pedunculi*, in which he obſerv'd three diſtinct Proceſſes on each ſide. The two firſt of which go on each ſide to the *Teſtes* before deſcrib'd, and betwixt them runs a Medullary Subſtance covering the upper part of the *Anus*, call'd *Valvula Major.* Pedunculi.

Major. The ſecond goes directly from the *Cerebellum* to the *Medulla Oblongata*, decuſſating the former, and forms the *Proceſſus Annularis.* The third ſpringing from the hinder part of the *Cerebellum*, is inſerted into the *Medulla Oblongata*, looking like an additional Chord to it.

Pons Varolii.

Beſides theſe, there are obſerv'd two or three other Medullary Proceſſes, which paſſing a-croſs the *Medulla Oblongata*, make that Arch, which from the Diſcoverer is call'd *Pons Varolii.*

Veſſels of the Cerebrum *and* Cerebellum.

All the afore-mentioned Parts of the Brain, and *Cerebellum*, are furniſh'd with Blood by two Pair of Arteries, which are the Carotids and the Vertebrals.

Carotids.

The firſt of theſe enters the Skull, thro' the Perforations of the *Os Sphœnoides*, on each ſide of the *Sella Equina*; and immediately ſends out ſome Branches to the *Glandula Pituitaria*, lying within that Cavity; which Branches, in moſt ſorts of Brutes, are more large and numerous than in Men; and being complicated with correſpondent Veins, make that conſpicuous *Plexus* of Veſſels, which in them is call'd the *Rete Mirabile*; but in Men is ſo inconſiderable, as generally, tho' not truly, to be thought wanting. After this, theſe Arteries piercing the *Dura Mater*, are divided into three principal Branches, which are call'd the Anterior, Lateral, and Poſterior. The Anterior, of each ſide, coming to a Conjunction near the Coalition of the Optick Nerves, ſend off two pretty fair Branches to the *Os Cribroſum.* The Lateral running a-croſs the two *Hemiſpheres* of the Brain, make a kind of Section of it, into the fore and hinder part. The Poſterior, meeting behind the *Infundibulum*, ſending of the two larger Twigs, on each ſide proceed in a ſingle Trunk to the *Protuberantia Annularis*, where that Trunk joyns with the Vertebral Arteries.

Rete Mirabile.

Tripartite Diviſion of the Carotids.

Theſe

Vertebral Arteries. Theſe enter the Skull through the great *Foramen* of the *Os Occipitis*, creeping up along the ſides of the *Medulla Oblongata*, under the *Baſis* of which they proceed ſeverally to the aforementioned Conjunction, where they meet and join with the ſingle Trunk of the *Carotids*.

Veins. The leſſer Ramifications of theſe Arteries are diſpers'd through all the Subſtance of the Brain, *Medulla Oblongata* and *Cerebellum*; where they meet with abundance of ſmall Veins, which do not come together in any Trunk, till they arrive at the ſeveral *Sinuſes* of the *Dura Mater*, from whence the Blood is return'd to the Heart by the Jugulars.

Bidloo's *Error concerning the Veins.* The want of a conſiderable Venous Trunk in any part of the Brain, *Medulla*, and *Cerebellum*, has occaſioned ſome Anatomiſts, particularly *Mr. Profeſſor *Bidloo*, to aſſert that there were no Veins in the Brain; an Error which he has ſtiffly maintain'd in his Epiſtle or Citation of Mr. *Cowper* before the Royal Society; altho' the Veins, which empty themſelves into the *Sinuſes*, be not only numerous but conſpicuous enough, and pretty fairly delineated in the Anatomical Figures publiſh'd by him, but not taken notice of in his Explication.

* Bidloo's Gulielmus. Cowper Citatus, &c.

Diſtribution of the Arteries in the Brain. The numerous minute Ramifications of theſe Arteries are ſcarce to be diſcovered in a general Diſſection of the Brain. But if the *Carotids* and *Vertebrals* be injected with Wax, they ſhew a very elegant Diſtribution thro' the whole Subſtance of all theſe Parts, as is expreſs'd in *Tab.* XV. EE, cc, dd, ee, f, g, h, i, *, p, q, r, *&c.* as alſo in the Scheme of all the large Trunks of the Arteries of the whole Body, hereafter to be met with.

CHAP. VI.

Of the MEDULLA SPINALIS.

Medulla Spinalis.

THE *Medulla Spinalis*, or Spinal Marrow, is little more than a Production of the *Medulla Oblongata*, or Medullary Part of the Brain. It conſiſts as the Brain does of two parts, a White or Medullary, and Cineritious or Glandulous; but with the Poſition inverted. For whereas in the Brain the Cineritious part is the Exterior every where (except in part of the *Baſis* in the Spinal Marrow) it is ſurrounded with the White Part, by which contrivance any unneceſſary Reflection of the Nerves is avoided, and they go immediately out from the Medullary Part, which they could not have done, had the Cineritious been external as in the Brain.

As ſoon as it falls out of the Skull thro' the great Hole of the Occipital Bone, it takes the Name of *Spinalis* inſtead of *Oblongata*.

Subſtance.

The Subſtance of the exterior part is much the ſame with that of the *Corpus Calloſum*, only ſomewhat more tough, and more diſtinctly fibrous; which difference the lower it deſcends is gradually more apparent. The reaſon of which difference is the ſtraitneſs of the Cavity, which growing gradually more narrow preſſes the Medullary Fibres cloſer together, and renders them more compact, and gathers them into more diſtinct *Faſciculi*; till having deſcended through the whole Tract of the Spine, they end at laſt in the *Cauda Equina*.

Spinal Nerves. Tab. XV.

Out of the *Medulla Spinalis* ſpring Thirty Pair of Nerves, which are nothing but Faſcicles of Medullary Fibres cover'd with their proper Membranes.

Coats. The Coats of it ſome reckon to be Four. The firſt or Exterior of which is a ſtrong Nervous Membrane, and ſerves as a Ligament to tie the *Vertebræ* together to the inſide of which it firmly adheres; and therefore is not ſo properly reckoned among the Coats of the *Medulla.* This generally appears moiſt with a viſcous Humour, and in Fat People is furniſh'd with an Oily Fat about the Junctures of the *Vertebræ.*

Second or Firſt proper. The Second, or rather Firſt proper Coat is a Production of the *Dura Mater*, which embracing the *Medulla* looſly on the hinder-part, takes firmer hold on it on each ſide at the egreſs of the Nerves. This Membrane, immediately upon its Exit from the Skull, where it adheres to the Margin of the great *Foramen*, grows ſo thick and ſtrong, and is furniſh'd with ſo many fleſhy Fibres, that it ſeems externally according to *Vieuſſen*, to reſemble a thick Ligament; and even on the inſide to appear both for Colour and Subſtance like a ſtrong fleſhy Membrane. Towards the fore-part it is looſly connected to the common Integument or inward Vertebral Membrane before deſcrib'd. In its Progreſs downwards, eſpecially after it has paſs'd the Vertebral of the Neck, it grows more thin and ſubtle.

This Membrane ſerves to defend the Spinal Marrow from any hurt from the Flexures of the *Vertebræ*, eſpecially in the Neck; the *Vertebræ* of which are ſubject to a more frequent, and greater variety of Motions and Contortions; for which reaſon it is ſtronger there than elſewhere. It ſeems likewiſe to defend the Spinal Marrow from receiving any Injury on the hinder-part by Cold, to which on the fore-part it is not expos'd, and therefore does not ſo much want this Covering; and laſtly, it is ſuppos'd by compreſſing the Body of the Spinal Marrow, to promote the Expulſion of whatever is ſecreted there.

Arachnoides, or the Second proper Coat.

The Third, or Second proper Coat, is a Production of the *Membrana Arachnoides*, and is a thin Pellucid Membrane lying between the *Dura* and *Pia Mater*, or the Firſt and Third proper Membranes of the *Medulla*, to the latter of which it adheres ſo cloſely on the fore-part and ſides, that it is hardly ſeparable from it, but eaſily enough on the hinder-part. This Membrane gives a Coat to the Nerves that go out of the Spine, which is the inner common Membrane of the Nerves, as that which comes from the *Dura Mater* gives the outer.

Third proper Coat.

The Fourth and laſt Coat, or Third proper, is a continuation of the *Pia Mater*, and is an exceſſive Fine Tranſparent Membrane, ſtrictly embracing the whole Subſtance of the *Medulla*, dividing it in the middle through the whole Tract, and making, as it were, two Columns of it.

Veſſels.

Arteries. Tab. xv.

The Vertebral Arteries in their aſcent to the Brain, ſend off on each ſide, a Twig to every Juncture of the *Vertebræ* of the Neck; and after their joyning at the *Protuberantia Annularis*, ſend back again a Branch, which running along the Spinal Marrow is call'd the Spinal Artery, and join'd at every *Vertebra* above the Heart, by thoſe Twigs already mention'd. Below the Heart the *Aorta* ſends Branches to every Joint of the *Vertebræ*. All theſe piercing the Subſtance of the *Medulla*, and ſending ſome Twigs to the Arterial Trunk, loſe the reſt in the *Caudex Medullaris*.

Veins.

The Blood is return'd by minute Ramifications of Veins into two Channels, which accompany the Spinal Marrow on each ſide through the whole Tract, and are call'd *Sinus Venoſi*, which ſend out their Branches in the Parts between the Head and the *Thorax* to the Cervical Veins; in the *Thorax* to the *Vena Sine Pari*, and below where the Trunk of the *Vena Cava* lies upon the Spine, immediately to the *Cava* it ſelf.

T A B. XVI.

F I G. I.

THE Annular Protuberance, and *Medulla Spinalis*, &c. cut thro' the middle, lengthways.

A A, The *Crura Medullæ Oblongatæ*.

B B, The Annular Protuberance, or *Pons Varolii* divided.

c c, Its Tranſverſe *Stria*.

e e, Its middle Medullary Tract, in which the *Striæ* terminate on each ſide.

f f, The Third, or Chordal Proceſſes of Dr. *Willis*.

h, The Spinal Marrow.

i i, Part of the *Cerebellum*.

k k, The Second Proceſſes of the *Cerebellum*, which compoſe the Annular Protuberance.

l l, The Cineritious part of the *Medulla Oblongata*.

F I G. II.

THE *Cerebellum* cut through on its hinder-part, and reclin'd laterally.

A A, The *Cerebellum*.

B B, The Arboreous Ramifications of the *Meditullium* of the *Cerebellum* appearing in this Section.

C C, The Pathetick Nerves at their Origins.

c c, The *Nates*.

d d, The *Teſtes*.

e, The Tranſverſe Proceſs where the Pathetick Nerves have their Original.

f, The *Glandula Pinealis*.

g g, The firſt Proceſs of the *Cerebellum*, running from it to the *Nates* here extended laterally.

h h, The Third, or Chordal Proceſſes.

i i, The Tranſverſe Medullary Proceſs in the Fourth Ventricle, where the ſoft Branch of the ſeventh Pair of Nerves has its Original.

k k, The Medullary Proceſs behind the *Teſtes* down to the other afore-mentioned Medullary Tranſverſe Proceſs.

l l, The Originals of the Proceſs.

m m, The Eighth Pair of Nerves.

n, The *Calamus ſcriptorius*, or extremity of the Fourth Ventricle.

o, The Spinal Marrow.

P P, The Acceſſory Nerves.

q q, The Tenth Pair of Nerves.

Tab: XVI.

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Fig: II.

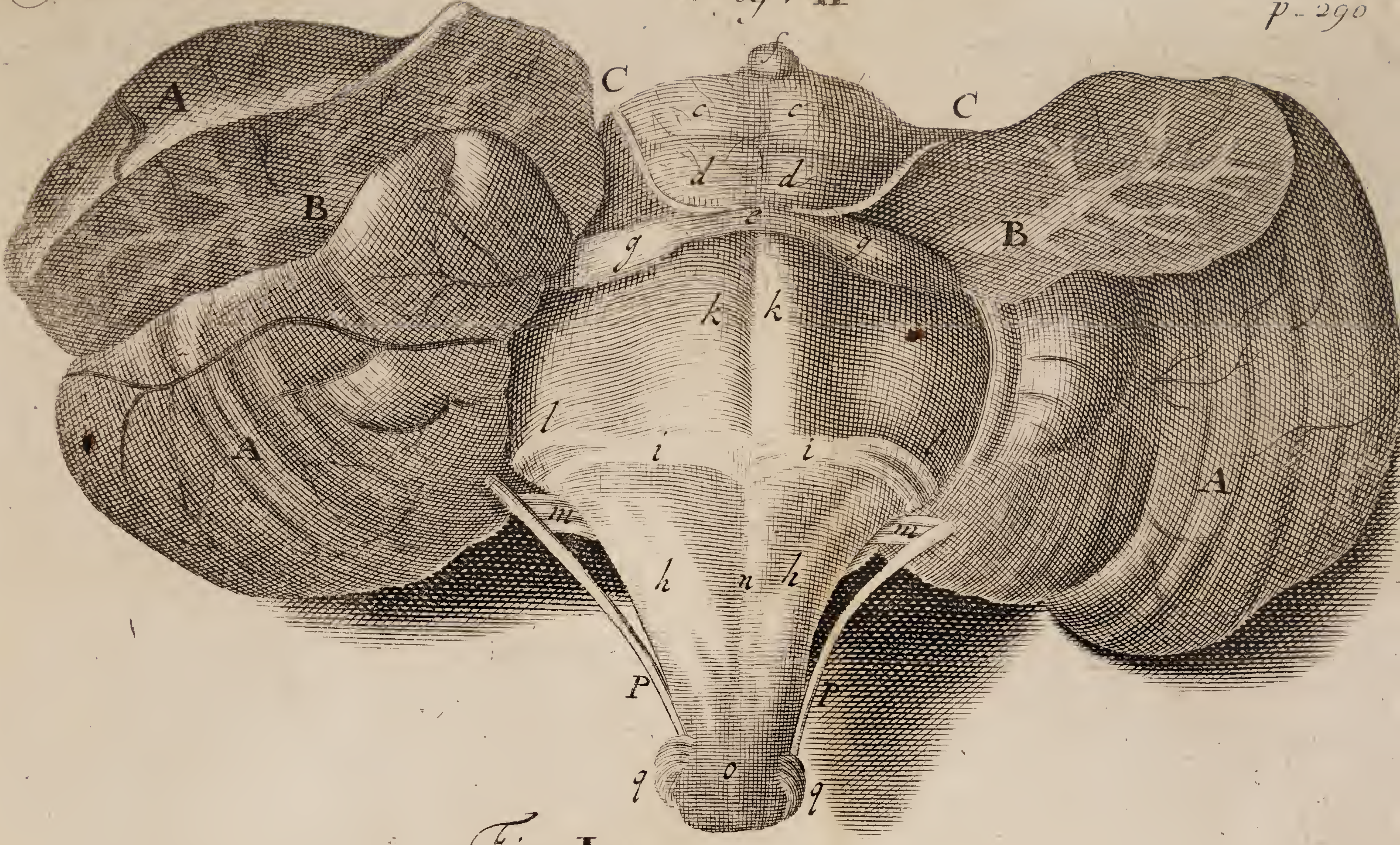
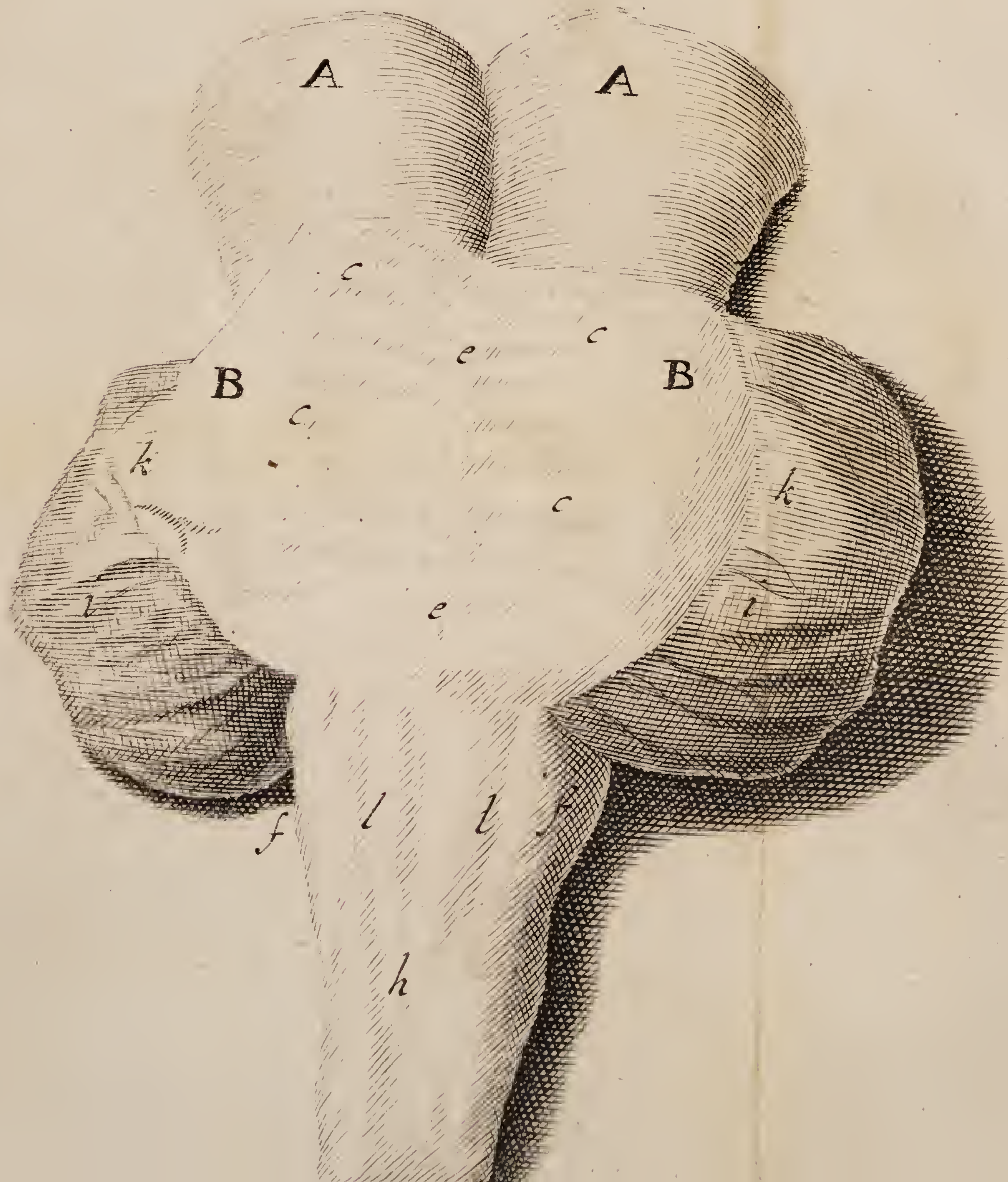


Fig: I.



CHAP. VII.

Of the NERVES *which have their Origine within the* SKULL.

THE Nerves being the Offſpring of the Brain, *Cerebellum*, *Medulla Oblongata*, and *Spinalis*, the Account of them ſeems naturally to follow the preceding.

Ten Pair of Nerves. They are, as has been already obſerved, in Number Ten Pair, which ariſe within the Skull.

Firſt Pair. Tab. xv. Numb. 1. The firſt Pair is the Olfactory, whoſe appearance within the Skull, and Exit, have already been deſcribed. Theſe, as ſoon as they have made their way through the *Os Cribroſum*, are diſtributed in the Membranes of the Noſe only, which in Men being ſhort and ſituate upon the *Os Cribroſum*, there is not much to be ſeen of it. Its uſe is for the Senſe of Smelling.

Optick Nerves. Ib. 2. The Optick Nerves, which are the next Pair, have almoſt as ſhort a Progreſs, being wholly ſpent upon the Tunicks of the Eye, of which the *Retina*, ſo call'd from its Reſemblance of Net-work, is an Expanſion of the inner or Medullary part of it only; and upon this the Impreſſion of the Objects of Viſion is ſuppos'd to be made. Theſe Nerves paſs out of the Skull thro' two Perforations in the Baſis of the Skull, a little above the *Sella Equina*, near the fore internal Proceſſes of the *Os Sphoenoides*, which lead directly to the Orbits of the Eyes. About the Trunk of theſe Nerves ſome Branches of the Third and Fifth Pair twine themſelves, ſending, probably, ſome Fibres to the Coats of it in their Proceſs to the Tunicks of the Eye.

Oculorum Motorii. Ib. 3. The Third Pair are call'd *Oculorum Motorii*. Theſe ariſe from the *Crura* of the *Medulla Oblon-*

gata, near the Annular Protuberance: Whence they march out between two Branches of the Cervical Artery, and paſſing out of the Skull at an irregular oblong hole, immediately underneath the former, are ſpent upon thoſe Muſcles of the Eye which are call'd Attollent, Depriment, Adducent and *Obliquus Inferior*; except ſome ſmall Fibres which go into the Muſcle of the upper *Palpebra*. App. Tab. xv. Fig vi.

Pathetici Tab. xv. No. 4. The Fourth Pair is the Pathetick, which riſes behind the *Teſtes*, and paſſes out of the Skull at the ſame *Foramen* with the former Pair, and ſpends itſelf wholly upon the Trochlear Muſcle.

The two firſt Pair of theſe Nerves ſerve only for Senſe. The firſt for Smelling, the latter for Sight; the two latter ſerve for both Senſe and Motion.

Fifth Pair. Ib. 5. The Fifth Pair, which is the largeſt of all thoſe that come from the Brain, has its uſe as well as diſtribution more extended, ſerving both for Senſe and Motion, for Touch and Taſte. It ſends Branches not only to the Eyes, Noſe, Palate, Tongue, Teeth, and almoſt all other parts of the Mouth and Face: But likewiſe into the Breaſt and lower Venter, by means of the Intercoſtals, which are partly compos'd of Branches of this Nerve.

Riſe. It ariſes from the ſide of the *Protuberantia Annularis* near the *Proceſſus Cerebelli.* It is at its Origine very large, but before its Egreſs from the *Dura Mater*, it is apparently divided into two Branches, conſiſting each of 'em of innumerable nervous Fibres, or Bundles of little Nerves, of which thoſe of one Branch are pretty tough and firm, the other ſoft and lax, and therefore it is divided into a hard and ſoft Branch. It is cloath'd with a Coat from the *Dura Mater*, and a little beyond the *Os Petroſum*, on each ſide of the *Sella Equina* forms a *Plexus*, which is call'd *Ganglioformis*, which receives ſmall Branches of Arteries from the Cervicals, and ſends both correſpondent Veins to the Lateral *Sinuſes*.

Diviſion.

Near the *Plexus Ganglioformis*, each of theſe Nerves is divided into an Anterior and Poſterior Branch.

Anterior Branch.

App. Tab. xV. Fig. v.

The Anterior or fore-Branch, after having ſent ſome Twigs into the *Dura Mater* is cover'd with a pretty thick Membrane, and enters the Receptacle on each ſide of the *Sella Equina*, where it ſends off ſometimes one, and ſometimes two Twigs, which together with a Twig of the Sixth Pair ſent off there likewiſe, end in the Intercoſtal Nerve; and as ſoon as it emerges from this Channel, it is again divided into three Branches pretty near equal.

Upper-Branch.

The upper of theſe three Branches, which is ſomewhat the leſſer, paſſing through the *Foramen Lacerum* to the Orbit of the Eye, is immediately ſub-divided into three leſſer Branches; of which the firſt having ſent off a Twig to the *Tunica Adnata* of the Eye, to the *Glandula Lachrymalis*, to the Muſcles that draw the Noſe upwards, to the Eye-lids and their Orbicular Muſcles, running over the Muſcle, which draws up the upper Eye-lid, is ſpent on the Muſcles of the Fore-head, and the common Integuments of the fore-part of the Head.

Second Branch.

The Second Branch, running under the Patheticks and *Motorii*, is again divided into two, of which the leſſer and outward ſlip which regards the leſſer *Canthus* of the Eye, ſends off ſeveral Fibrils into the Fat, which envelops the Optick Nerve; and joyning with others from the Third Pair, form a little ſort of *Plexus* upon the Trunk of the Optick Nerve itſelf, from whence the Fibrils proceeding through the Fat, which covers the hinder-part of the *Tunica Sclerotica*,

Plexus Opthalmicus.

end ſome of them in the *Muſculus Deprimens*, others in the *Abducens*, and the reſt in the *Tunica Sclerotica* it ſelf.

The inner, which is the bigger ſlip of the Second Branch, is again divided into four Twigs. The firſt running over the Optick Nerve, againſt the great *Canthus* of the Eye, enters the *Tunica Sclerotica*, and is ſpent in the Membrane. The ſecond, returning into the Skull by a peculiar Perforation, pierces the *Craſſa Meninx*, to which it probably gives ſome Twigs, as the difficulty of ſeparating it from it ſeems to argue; and ſometimes turning back again, paſſes out of the Skull through one of the holes of the *Cribriforme*, and is diſtributed into the Interior Membrane of the Noſe. The third Twig goes towards the greater *Canthus* of the Eye, and is ſpent partly on the Eye-lids and their Orbicular Muſcles, upon the External Integument of the Noſe, and the Muſcles which draw it upwards. The fourth is diſtributed by ſeveral Twigs into the Eye-lids and the Orbicular Muſcles.

Third Branch. The third ſlip of this Superior Branch running under the Nerve of the Sixth Pair, and the Abducent Muſcle, is ſpent on the *Glandula Innominata* and *Tunica adnata.*

Inferior Branch. The leſſer Inferior Branch, before it goes out of the Skull, enters the Orbit of the Eye, and running along the out-ſide of the *Muſculus Abducens*, goes out again at a little Perforation peculiar to it; after which being divided into ſeveral Fibres; ſome of which go to the Integuments of the Cheeks, and the reſt to the Muſcles that raiſe the upper-Lip. As ſoon as this Branch goes out of the Skull at the third *Foramen*, it is again divided into three little Branches; of which the firſt, after having beſtow'd ſome Twigs upon the *Muſculus Maſſeter*, upon the Teguments of the Face, upon the Gums and

Teeth of the upper-Jaw, enters a peculiar *Sinus* of the Bone, making the lower part of the Orbit of the Eye, and goes out at a hole particular to it; after which it is divided into ſeveral Fibrils, which go to the Teguments of the Face, to the upper-Lip, to the Muſcle which draws the lower-part of the Noſe laterally, and to the inner Muſcle of the Noſe. The ſecond ſmall Branch running downwards behind the Ducts, which go from the Noſe to the *Fauces*, is divided into two, of which the upper by many Twigs is diſtributed into the *Membrana Pituitaria.* The lower paſſing through a peculiar Hole on the hinder and lateral part of the Bone of the Palate, is diſtributed into that ſpongy Fleſh, that lines the Palate, and the tough Membrane that covers it. The third little Branch is ſpent on that part of the *Membrana Pituitaria* which lines the *Fauces* upon the *Uvula*, and Muſcles thereabouts, and upon the Tonſils.

The *Ramus Major* or *Poſterior*, after having beſtow'd ſome Twigs upon the *Dura Mater*, receives a Coat from that, and the *Pia Mater* cloath'd, with which it paſſes out of the Skull through the Fifth *Foramen*, and having ſent off ſome Twigs to the *Muſculus Buccinator*, *Maſſeter*, and thoſe of the lower Jaw, is divided into three conſiderable Branches. *Poſterior.*

The firſt of theſe, being join'd by a Twig of the hard part of the Auditory Nerve from the Barrel of the Ear, goes to the root of the Tongue; from whence proceeding forewards, it ſends ſeveral Twigs to the Maxillar Glands. From the outer-ſide it ſends likewiſe divers others, which, running along the inner Subſtance of the Tongue, end in Capillars at the Extremity of it; and joining every where with the Branches of the Ninth Pair, ſerve both the Muſcles, and the Papillary

Glands; and therefore ſeem to contribute as well to the Taſte as the Motion of the Tongue.

The ſecond or middle Branch ſending off firſt one Twig, which is diſtributed partly into the Maxillar Glands, and partly into the Muſcles *Stylogloſſus* and *Myloglossus*, enters the *Sinus* or Hollow of the lower-Jaw, along which it runs, accompany'd with Branches of the Carotid Arteries and little Veins, which return to the Internal Jugulars; and beſides ſending off a Twig to each Tooth, with the Membranes of the aforeſaid Veſſels, contributes towards forming a Membrane, which lines the whole *Sinus*. At the fourth *Molaris* or Grinder, it is divided into two Branches: The leſſer of which runs on to the very Commiſſure, or joyning of the Jaw. The bigger, paſſing out at a peculiar Perforation, is divided into ſeveral Fibres, which are diſpos'd into the Muſcles of the lower-Lip, and into the Chin.

The Third and Exterior Ramifications of this greater and poſterior Branch are ſpent upon the Carotid Glands.

The Sixth Pair. Tab. xv. No. 6.

The Sixth Pair of Nerves riſes from the Medullary Tracts of the *Centrum Ovale*, juſt below the *Proceſſus Annularis*, and proceeding forwards enters the ſame Receptacle or *Sinus* of the Skull, on the ſide of the *Sella Equina*, as the Fifth Pair does; where ſending off a Twig conſiſting ſometimes of two, ſometimes of three Fibres, which joining thoſe of the Fifth Pair, before-mention'd, go to the Intercoſtals; it goes out of the Skull at the ſame hole with the *Oculorum Motorii*, and ends in the Abducent Muſcles of the Eye. Beſides which it ſends ſome ſmall Twigs to the Tongue, and therefore is reckon'd among the Guſtatory Nerves.

Seventh Pair, or Auditory Nerves.

The Seventh Pair, or Auditory Nerves, paſſes out of the Skull through a hole of the *Os Petroſum*, which is the Seventh Perforation. It ariſes from the Medullary Tract of the fourth Ventricle, and emerges behind the *Proceſſus Annularis*, near the eighth Pair, with which the ſoft part of it joyns. As ſoon as it is paſſed out of the Skull, it is divided into two Branches, a hard and a ſoft one, which immediately part; the hard entring a little *Sinus* in the upper part of the Bone, which conſtitutes the Barrel of the Ear, where it ſends off a Twig, which turning towards the fore-part of the Skull, goes out of the *Os Petroſum*, and is diſtributed into the *Dura Mater*; except ſome ſmall Twigs which go to the Membrane which lines the Barrel, to the internal Muſcles of the Ear, and to the fine Membrane that cloaths the inſide of the Cavity of the *Apophyſis Mamillaris*. After this the hard Branch ſends off two other Twigs; one of which joyns the Nerves of the eighth Pair, a little above its *Plexus Ganglioformis*; the other goes to the *Tympanum*, of which it makes the Chord, and creeping over the handle of the *Malleolus* goes out of the Ear, and runs downward between the *Muſculus Pterigoidæus Internus* and the Tongue; into which latter it ſends a Ramification, which joyns with a Twig of the poſterior Branch of the fifth Pair, before deſcrib'd.

Ib. No. 7.
Tab. xvi.
Fig. ii.

Beſides theſe, the hard Branch coming out of the *Proceſſus Mamillaris*, ſends ſome Twigs to the *Muſculus Maſſeter*, and others to the Glands about the Ear; where being divided into two other Ramifications, the interior of theſe having firſt beſtow'd ſome Fibres upon the Glands themſelves, turns off towards the Cheek; and is divided into ſeveral Fibrils, of which one, joyning with another belonging to the fifth Pair, goes to the upper Lip. The reſt are ſpent on the lower *Palpebra*, and upon the external part of the Face.

The exterior Ramification of this hard part, after having likewiſe beſtow'd ſome Fibrils upon the Glands, out of which it iſſues, is divided into two other Ramifications; the upper of which is diſtributed into the *Muſculus Quadratus* of the lower Jaw, and outer parts and Muſcles of the lower Lip. The lower Ramification is ſpent upon the Integuments of the fore and lateral Parts of the Neck, upon ſome Muſcles of the lower Jaw, and upon the Muſcle *Maſtoides.*

The ſoft Branch of the ſeventh Pair is larger than the hard, altho' it ſeems to conſiſt of fewer Fibres. It is divided into three Ramifications, of which the ſuperior paſſes thro' a ſmall *Foramen* peculiar to it into the *Concha* of the Ear; where it expands it ſelf, and forms a very fine Membrane, which lines all the inner Surface of it. The ſecond and third Ramifications go likewiſe to the inner part of the *Concha* and ſemicircular Ducts, which they furniſh with Membranes that are the immediate Inſtruments and Organs of Hearing.

Par Vagum, *or eighth Pair.* Tab. xv. No. 8.

The eighth Pair, by the Antients eſteem'd the ſixth, is both by them and the Moderns call'd *Par Vagum.* Theſe ſpring from the *Medulla Oblongata*, a little above the *Corpora Olivaria*, and paſs out of the Skull through the ſame Perforations, with the lateral Sinuſes of the *Dura Mater.* Along with them, wrapp'd up in the ſame Coat from the *Dura Mater*, paſſes a Pair of Nerves, which has its Origine from the *Medulla* contain'd in the *Vertebræ* of the Neck, and is call'd *Par Acceſſorium*; which ſoon after its return out of the Skull, leaves the *Par Vagum* again, and is diſtributed into the Muſcles of the Neck and Shoulders. Beſides, it is join'd by a Twig of the hard part of the ſeventh Pair, and at the ſecond *Vertebra* of the Neck, by the Nerves that iſſue from the Cervical Marrow there,

Par Acceſſorium App. Tab. xvi

there, and ſends forth ſeveral Twigs to the Muſcles of the *Larynx*, *Gula*, Neck, and the Parts thereabouts; eſpecially from a Ganglioform *Plexus*, form'd by its Union with a Branch of the *Intercoſtal.* After this, deſcending along the Trunk of the *Aſpera Arteria* to the *Thorax*, it makes another *Plexus* immediately under the Clavicle; from which *Plexus*, on the right ſide, the recurrent Nerve on that ſide has its Riſe, tho' on the left it ſprings from the Trunk of the Nerve it ſelf. The right recurrent is reflected at the Axillary Artery, and the left at the deſcending Branch of the *Aorta*; and both run up along the ſides of the *Trachea*, to which they impart ſome Twigs, and end at laſt in the Muſcles of the *Larynx*. Theſe ſerve for the Formation and modulating of the Voice, as appears by a Dog's not being able to bark after they are cut.

Plexus Ganglioformis *ſuperior.*

Inferior.

Recurrents

Over againſt the Origine of the great Artery, it ſends off a conſiderable Branch towards the Heart, which ſplitting it ſelf preſently into two, the leſſer Branch twiſts about and embraces the Pulmonary Vein; the bigger joining with that of the oppoſite Side goes to the *Pericardium*, and the Subſtance of the Heart and its Auricles, after having ſent off one Twig; which joining with others from the Trunks of the *Intercoſtals*, makes the *Plexus Cardiacus Superior*; which ſending out one Branch, which ſtrictly embraces the Pulmonary Artery, beſtows the reſt upon the Heart it ſelf.

App. Tab. xvi.

Plexus Cardiacus *ſuperior.*

Proceeding yet farther, it ſends out divers Ramifications, which meeting again together, make the *Plexus Pneumonicus*, from which many nervous Fibres are ſent out, which embrace and conſtringe the Veſicles and Veſſels of the Lungs, as well thoſe of Air as of Blood, which they variouſly enfold and twine about.

Plexus Pneumonicus.

In its paſſage downwards it diſtributes ſeveral Branches to the *Oeſophagus*, along which it runs. About the lower *Vertebræ* of the Back the Trunk is divided into two Branches, call'd the external and internal, which communicate with each other by the concourſe of ſeveral Ramifications. But afterwards theſe two principal Branches joyn again, the Internals of each ſide with one another forming one Trunk; and the Externals by their Communication forming another; and paſſing the *Diaphragm*, they are ſpent upon the Stomach, eſpecially its upper Orifice. The remainder of this Pair joyns with the *Intercoſtals*, in the Formation of ſeveral *Plexus* in the lower Venter, and in them it ſeems to terminate. App. Tab. xvi.

Intercoſtals. The Trunk of the *Intercoſtal* Nerve conſiſts of nervous Filaments, deriv'd partly from the Brain, which are the Branches of the fifth and ſixth Pair, (whoſe Coalition in a *Sinus* of the Skull near the *Sella Equina*, we have already taken notice of) and partly from the Spinal Marrow, by thoſe Branches which they receive from the Vertebral Nerves. In each Trunk of theſe Nerves, before it arrives at the *Thorax*, are two *Plexus Ganglioformes*, call'd *Plexus Cervicales*; the upper of which receives a Branch of a Nerve from each Trunk of the *Par Vagum*, and is ſituate juſt at the egreſs of the Skull. The next *Plexus* is about the middle of the Neck, and ſends out divers Ramifications to the *Oeſophagus* and *Aſpera Arteria*, and one larger than the reſt to the recurrent Nerve. From this *Plexus* likewiſe deſcend two pretty conſiderable Ramifications to the Cardiac *Plexus*, which are joyn'd a little lower by a third. Plexus Cervicales.

Truncus Intercoſtalis. From this ſecond *Plexus* the *Intercoſtal* Trunk deſcends to the Clavicles, where being ſplit into two, it embraces and conſtringes the Subclavian Artery; thence entring the *Thorax*, it receives three or four Twigs from the upper Vertebral

Nerves, together with which it conſtitutes the *Plexus Intercoſtalis*, and from thence deſcends along the ſides of the *Vertebræ*, receiving a nervous Twig from every one of them to the *Os Sacrum*; and coming into the *Abdomen*, it forms ſeveral conſiderable *Plexus*, which are the *Lienaris*, *Hepaticus*, the two *Renales*, *Meſentericus Magnus*, and two little ones in the *Pelvis*.

App. Tab. xvi.

Several conſiderable Plexus

After this has reach'd the *Abdomen*, it ſends off on each ſide a conſiderable Branch, call'd, by *Willis*, *Ramus Meſentericus*, out of which the afore-nam'd *Plexus* are form'd. This Branch is divided into two others; of which the bigger, turning towards the Stomach, forms a *Plexus*, from which come four *Faſciculi*, or Bundles of Fibres, to the Stomach, to the Spleen, to the Hepatick *Plexus*, and the great *Plexus* of the Meſentery.

Ramus Meſentericus.

Upon the right ſide the Meſenteric Branch is ſub-divided into two, (as is that of the left likewiſe) the Superior of which makes the main part of the *Plexus Hepaticus*; from whence proceed a great Number of Nerves to the Liver, ſtrictly embracing, as it were with a kind of Net-work, the Blood-Veſſels, and ſending out their reſpective Ramifications to the Gall, Bladder, and Bilary Ducts; and likewiſe to the *Duodenum*, *Pylorus*, and *Pancreas*. This *Plexus*, by means of ſome Ramifications, communicates with the *Plexus Lienaris*, (which is form'd out of the Branches of the left *Intercoſtal*) and likewiſe with the *Meſentericus Magnus*, and *Renalis Dexter*.

Plexus Hepaticus.

Lienaris.
App.
Tab. xvi.

The lower Branches of the Meſentericks, near the *Capſula Atrabilaria*, form the *Plexus Renales*, from whence ſeveral nervous Fibres go to the Kidnies, which accompany and involve the Blood-Veſſels, as in the Liver.

Plexus Renales.

The great Meſenteric *Plexus* is form'd out of the concurrent Branches of ſeveral other *Plexus*,

Meſentericus Magnus.

and ſends its nervous Fibres through the whole Meſentery, along with the Meſeraick Veſſels; which, with various Circumligations, they accompany to the Inteſtines. Other Branches it ſends to the Trunk of the *Aorta Deſcendens*, and to the Ovaries in Women.

Plexus Infimus Abdominis. A little below the Kidnies, the Trunk of the *Intercoſtals* verges a little inwards, and deſcends into the *Pelvis* to the *Os Sacrum*; about the beginning of which, together with the Vertebral Branches, it makes the loweſt *Plexus* of the *Abdomen*; from whence a tolerable Branch being reflected a little upwards, makes near the former another little *Plexus*, which is the leaſt of all. Minimus

From theſe two *Plexus* a Branch is return'd to the great Meſenteric *Plexus*, which in its way viſits the *Inteſtinum Rectum* and *Colon*. Another Branch deſcends from the lower *Plexus*, behind the *Inteſtinum Rectum*, to which all along it gives ſeveral Twigs. The remainder, having ſent off ſome Ramifications to the Ureters, proceeds downwards to the *Sphincter Ani*, into which, and the neighbouring parts, it is diſtributed.

The ninth and tenth Pair are already ſpoken to, as far as is neceſſary, in the Account of the Brain.

CHAP. VIII.

Of the Nerves *from the* Spinal Marrow.

Spinal Nerves. BEſides thoſe ten Pair which ariſe from the *Medulla Oblongata*, within the Skull, there are thirty other Pair of Nerves, which ſpringing from the ſame *Medulla*, after its Egreſs out of the Skull, are call'd Spinal Nerves, becauſe of the change of Name which the *Medulla* undergoes immediately upon its *Exit* from the Skull.

Of theſe thirty Pair ſeven are reckon'd to the Neck, twelve to the *Dorſum* or Back, five to the Loins, and ſix to the *Os Sacrum*. Theſe, according to their ſeveral Originations, or Places whence they take their Riſe, are call'd Cervicals, Dorſals, Lumbals, and Nerves of the *Os Sacrum*. *Diviſion.*

The firſt Pair of Cervical Nerves ariſes betwixt the firſt and ſecond *Vertebra* of the Neck, (for thoſe that have their *Exit* between the Bone of the *Occiput* and firſt *Vertebra*, are reckon'd the tenth Pair of the Brain) and, contrary to the reſt, come out before and behind; whereas the other ſix Pair come out laterally from the Junctures of the *Vertebræ*, thro' particular Perforations, near the tranſverſe Proceſſes. *Cervical Nerves.*

The firſt Pair of Cervical Nerves goes to the Muſcles of the Head and Ear. *Firſt Pair.*

The ſecond, according to Dr. *Willis*, contributes the main Branch towards the Formation of the Diaphragmatick Nerves, which, according to *Vieuſſens*, ſpring only from the fourth and ſixth Pair. *The ſecond* *Diaphragmatick Nerves.*

The three laſt Pair of the Neck, joining with the two firſt of the *Dorſum* or *Thorax*, make the Brachial Nerves.

All the Cervical Nerves ſend innumerable Branches to the Muſcles, and other parts of the Head, Neck, and Shoulders.

The Dorſal Nerves, beſides what the two upper Pair contribute to the Brachial Nerves, are for the moſt part diſtributed into the Intercoſtal and Abdominal Muſcles, the *Pleura* and external Parts of the *Thorax*. *Dorſal.*

The firſt Pair of the Lumbal Nerves ſends from each ſide a Branch to the lower ſide of the *Diaphragm*. The ſecond ſends ſome Twigs to the Genital Parts: Beſides ſome from this, as well as the three following Pair, which give the firſt Roots to the Crural Nerves. The reſt of the *Lumbal Nerves.*

the Branches of the Lumbal Nerves are diſtributed into the Muſcles of the Loins and adjacent Parts.

Nerves of the Os Sacrum. The firſt three or four Pair of the Nerves of the *Os Sacrum*, are beſtow'd entirely upon the Crural Nerves; the reſt upon the Muſcles of the *Anus*, *Veſica*, and *Genital* Parts.

Brachial Nerves. The Brachial Nerves, which are the Off-ſpring partly of the Cervical, and partly of the Dorſals, after the ſeveral Branches of which they are compos'd, have been variouſly complicated and united, run but a little way in a Trunk before they divide again into ſeveral Branches, which are variouſly diſtributed into the Muſcles of the Skin and Arms.

Diaphragmatick Nerves. The Diaphragmatick Nerves, which are likewiſe the Offspring of the Cervical, after joyning in a Trunk, run thro' the *Mediaſtinum* undivided, till they arrive near the *Diaphragm*, into which they ſend off divers Branches, ſome into the Muſcular, others into the Tendinous Part of it.

Crural Nerves. The Crural Nerves, which conſiſt of an union of ſix or ſeven Pair, *viz.* the three laſt of the Lumbal, and three or four firſt of the *Os Sacrum*, after having ſpent their upper Branches upon the Muſcles of the Thigh and the Skin, as far as the Knee, proceed in a Trunk downwards, which ſends its Branches to the Extremities of the Toes, ſupplying, as it goes, the Muſcles and Skin of the Leg and Foot. This is the largeſt and firmeſt nervous Trunk in the whole Body.

CHAP. IX.

Of the Face.

THE Face itſelf, as to its external Figure, is ſo well known to every Body, that it needs no anatomical Deſcription or Diviſion. For tho' it be the Part the moſt regarded, as well by the judicious as voluptuous part of Mankind, for Information as well as Pleaſure; and tho' we be thence inform'd in many Caſes, not only of the Paſſions of Mens Minds, but the Diſtempers of their Bodies likewiſe; yet it affords but little Matter for anatomical Speculation, which will be more properly handled in the Deſcription of the ſeveral Parts, which being to be diſtinctly treated of, we ſhall refer them thither.

CHAP. X.

Of the Noſe.

By Mr. William Cowper.

THE Noſe has been uſually divided into internal and external; which Diviſion I mention, becauſe it is conſtantly found in the Writings of Anatomiſts, though it be of no great Importance.

External Parts. It is again ſub-divided into ſeveral Parts, which make up its external Figure; of which the firſt is the *Dorſum*, or Ridge, running along the whole length of it. In which, one part, (in thoſe we call Roman Noſes eſpecially) about the middle, is more prominent than the reſt, and is call'd the Spine; and the Extremity, which in many is turn'd

Dorſum Naſi.

turn'd round, is nam'd the *Orbiculus*, or tip of the Noſe; the ſides are call'd the *Alæ* or *Pinnæ*.

The Muſcles of the Noſe. Elevatores Alæ Naſi. Tab xviii Fig. i.

The Teguments of the Noſe, which are common to it, and other parts of the Face, being remov'd, the Muſcles of the *Alæ Naſi* appear. The firſt of theſe is of a pyramidal Figure: It is very narrow, though fleſhy, at its Origination on the fourth Bone of the upper Jaw, near the *Foramen Lachrymale*, and upper-part of the Noſe by the great *Canthus* of the Eye, and becomes very broad and thin at its fleſhy Termination, on the ſide of the *Ala Niſi*. When it acts, it pulls the *Ala* upwards, and turns it outwards.

Dilatatores Alæ Naſi. Tab. xviii Fig. ii, iii.

The next Muſcle, or Pair of Muſcles, are common to the *Alæ Naſi* and upper-Lip. They ariſe thin, broad, and fleſhy from the Cheek-Bones, under the Orbits of the Eyes, and deſcend obliquely with a two-fold Order of fleſhy Fibres in each Muſcle, which partly terminate in the upper Lip, and partly in the *Alæ Naſi*. Theſe draw the *Alæ* from each other, and widen the external openings of the Noſtrils.

Conſtrictores Alæ Naſi. Tab. xviii Fig iii.

The third Pair are alſo common to the *Alæ* and upper Lip. They ariſe fleſhy from the fore-parts of the fourth Bone of the upper Jaw, immediately above the Gums of the *Dentes inciſorii*, and are ſoon inſerted after a ſtraight aſcent to the Roots of the *Alæ Naſi*, and ſuperior parts of the upper Lip. Theſe draw the *Alæ* downwards nearer each other, and at the ſame time draw the upper Lip alſo downwards; which Action we uſe when we take Snuff, or endeavour to receive any odoriferous *Effluvia*.

The frame of the noſe is mainly ſupported by two Bones, which end in Cartilages of a triangular Figure, and are divided in the middle by a third into two partitions, call'd the Noſtrils; this *Septum* ends likewiſe in a Cartilage, by means of which Cartilages the lower part of the Noſe is render'd moveable, which the upper that is perfectly Oſſeous is not.

Tab. xvii. Fig. i, ii, iii.

The Cartilages of the *Alæ Naſi* are ty'd to thoſe at the extremities of the two Bones of the Noſe by Ligaments, which looſe Connexion renders them moveable. Profeſſor *Ruyſch* (*Epiſt. Anatom.* 8.) tells us of two Pair of Cartilages more that belong to this part, which are not exiſtent in all, or in moſt Bodies; and if there ever were ſuch, muſt be look'd upon as a *Luſus Naturæ*.

Bones of the Noſe, common and proper.

The Bones of the Noſe are either proper or common. The proper are ſuch as are only ſubſervient to the uſe of the Noſe: The common help to frame the *Foramina Narium*, as well as the neighbouring parts.

1ſt, proper Bone. Tab.xviii. Fig. i. H.

The firſt of the proper Bones of the Noſe are the two external ones, mention'd above, that conſtitute the *Dorſum Naſi*; they are the moſt ſolid of all the Bones of this part, and are join'd to the *Oſſa Frontis*, fourth Bone of the upper-Jaw, and to each other *per Harmoniam*; but in ſome ſubjects, *per Suturam*, eſpecially at the *Oſſa Frontis*, and Fourth Bone of the upper-Jaw: They are each of a Quadrangular Figure; their lower parts that are join'd with the Cartilages of the *Alæ* are uneven; they have each a remarkable Aperture externally, for the Blood-Veſſels, from which, Branches paſs to the Glandulous Membrane, that cleaves to the inſides of theſe Bones, which are furrow'd: Their outſides are ſmooth.

2d. Proper Bone called Septum. Ib Fig. v. C. H. Criſta Galli.

In the Concave of the Arch of theſe two Bones, at their union with each other internally, is plac'd the bony part of the *Septum Narium*. Its upper-part joins with the *Os Ethmoides*; but in Adults is continued; ſo that the *Os Ethmoides* and its Proceſs, call'd *Criſta Galli*, appear to be one intire Bone with this *Septum*. It is thinneſt in its middle, where there are frequently found ſome irre-

App. Tab. xlix. Fig. iii. irregular inequalities, and divides the right Noſtril from the left: Though its Poſition is ſeldom found Perpendicular, but commonly inclines to one ſide or t'other variouſly in different Bodies; Its upper-part (continued from the *Ethmoides* to the *Os Sphenoides*) is thickeſt, but ſoon becomes very thin towards the *Fauces*, or back-part of the *Foramina Narium*. This *Septum* is capt with another thin Bone, call'd *Vomer Aratri*, from its Figure. The lower part of this *Septum* is joyned to the Internal and Superior Surface of the Fourth Bone of the upper-Jaw, that makes the Roof of the Mouth, and backwards again to the *Oſſa Palati* by Harmony. Vomer. Tab.xviii. Fig. i. N.

Oſſa Turbinata ſeu Spongioſa. Tab. xvii. Fig. iv. I, K. The other proper Bones belonging to the Noſe, are call'd *Turbinata* and *Spongioſa*. There are commonly found two of theſe Bones in each Noſtril, placed one above the other, in ſome Subjects you'll find three; The two lower-moſt are never wanting in a natural State; The uppermoſt, that ſeems to be a part of the *Os Ethmoides*, is very irregular, and is but rarely ſeen; The middle-moſt, which is always the largeſt when there are three, cleaves to the ſide of the Fourth Bone of the upper-Jaw, that is next to the *Foramina Narium* of the ſame ſide, which part of the fourth Bone of the upper-Jaw makes the Internal *Paries* of the *Antrum Maxillæ Superioris* next to the *Foramen* of that Noſtril. This *Os Turbinatum* is ſo placed as to ſhelter or cover the Perforation of the *Antrum* into the Noſtril, and prevents the ſudden ruſhing in of Air from the Noſtril into the *Antrum*.

Ib. K. The third and lower-moſt *Os Turbinatum* in Adults, is not diſtinguiſh'd by any Suture from the ſides of the *Antrum Maxillæ*, but ſeems to be a Production of the *Antrum* turning down towards the *Os Palati*, and Internal Surface of the fourth

Bone of the upper-Jaw, that makes the Roof of the Mouth.

All theſe *Oſſa Turbinata* are very porous, and are turn'd not unlike the ſhell of the *Concha Veneris.*

In Quadrupeds, eſpecially large ones, theſe *Oſſa Turbinata* are not only numerous, but very thin and large, and ſome of them are turn'd up not unlike to a piece of Paper rowl'd up to make Portable, ſo as to prevent Folds.

The common Bones of the Noſe, are ſuch as make Fences for the *Foramina Narium*, and help to compoſe the parts adjacent: The largeſt of theſe, is what firſt offers itſelf to our ſight; which we have had occaſion ſo often to mention by the Title of the Fourth Bone of the upper-Jaw; which is particularly deſcrib'd among the Bones of that part, and which indeed has the greateſt ſhare in framing the *Foramina Narium.* The External bony part of the *Foramina Narium* is fram'd by thoſe Bones on both ſides, except in the upper-part, which is ſupported by the two firſt proper Bones of the Noſe, as abovesaid. Theſe Four Bones of the upper-Jaw, with the *Septum* and *Oſſa Turbinata*, chiefly frame the Internal *Paries* of the *Foramina Narium:* In the upper-part a Portion of the *Os Frontis*, the inſide of the *Os Unguis*; the *Os Cribroſum*, with part of the *Os Sphenoides*; And backwards towards the *Fauces*, the *Oſſa Palati* help to compoſe the *Foramina Narium.*

Common Bones.

Ib. K.

Tab. xviii. Fig. i. III.

Beſides the Cavities, circumſcrib'd by the Bones now mention'd, the *Foramina Narium* have divers collateral Cavities that open into them.

Cavities.

The uppermoſt of theſe Cavities is found in the *Os Frontis*; this is commonly taken notice of, becauſe it is ſo frequently ſeen in dividing the Skull to take out the Brain. In thoſe Bodies, where

App. Tab. xlix. Fig. iii.

where they are found (for in ſome they are not exiſtent) they are placed in the lower and middle part of the *Os Frontis*, between the Eye-brows; that of the right being divided from the left by a bony *Septum*; in ſome Subjects they are very large, and extended over the Orbit of the Eyes, in whom we ſee the Eye-brows very prominent: Each of theſe open by ſmall Ducts into the upper parts of the *Foramina Narium*, under the Superior *Os Turbinatum*. Beſides theſe, in that part of the *Os Frontis*, that is contiguous to the *Os Unguis* in the Orbit of the Eye, there are divers irregular Cells, which alſo open into one another, and into the *Foramina Narium* and *Antrum Maxillæ Superioris*. Backwards theſe Cells alſo open into the Cavity of the *Cella Sphenoidis*. Theſe Cells are not (at leaſt commonly) taken notice of by Anatomiſts.

Tab. xvii. Fig iv. G.

The next conſiderable Cavities that communicate with the *Foramina Narium*, are in that part of the *Os Sphenoides*, that frames the *Sella Equina*. Theſe Cavities are very large, and that of the right-ſide is divided from the left by a bony *Septum*. This *Septum* is not always in the middle, ſo that theſe Cavities are irregular, as to their Magnitude and Figure.

When the bony *Septum* happens to divide 'em equally, as in a Subject now before me, they are each about three quarters of an Inch in length, and more than half an Inch in breadth: In another Subject the Sphenoidal Cavity of the left-ſide is more than twice as big as the right, and their *Septum* inclines to the ſame ſide with the *Septum Narium* of the ſame Subject. They have each an opening into the *Foramina Narium*, under the *Os Turbinatum Superius*. Neither theſe Cavities of the *Os Sphenoides*, nor thoſe large ones of the Cheeks, are found in a *Fœtus*, but inſtead thereof an Oſſeous *Meditullium* only poſſeſſes theſe parts, not unlike the *Diploe* of the *Cranium.*

The largeſt and laſt Cavity we ſhall mention belonging to each of the Noſtrils, is by *Caſſerius* call'd *Antrum Genæ*, Dr. *Highmore* calls it *Antrum Maxillæ Superioris :* It is fram'd in the Fourth Bone of the upper Jaw, between the lower Margin of the Orbit of the Eye, and *Dentes Molares* of the ſame ſide. Backwards the thin bony *Paries* of this Cavity with the *Os Sphenoides*, make the *Foramen Lacerum Externum.* This Cavity is near two Inches in length from the forepart backwards, and exceeds an Inch from its Superior to its Inferior Surface; its Figure inclines to a Triangular, with very obtuſe Points: To diſcover it fairly, divide the Bone with a Saw or Chizel, near the *Dentes Molares* of the upper-Jaw, and you'l preſently break into this large Cavity, the Magnitude of which will a little ſurprize one who has not been converſant in theſe matters: The lower Surface of this Cavity makes a thin covering to all the Roots of the *Dentes Molares*, as well as the *Dens Caninus* of the ſame ſide, and is very thin, and frequently upon drawing any Tooth, to which it ſticks, taken along with it; whereby this Cavity is open'd into the *Alveolus*, and conſequently into the Mouth. An Inſtance of this is mention'd by Dr. *Highmore* in a Gentlewomen, who had the *Dens Caninus* drawn upon the account of Pain, proceeding from an Inveterate Defluxion of ſharp Humours that had deſtroy'd moſt of her Teeth; who upon thruſting a Silver Bodkin into the *Alveolus*, was exceedingly frighted to find it paſs, as it did, almoſt to her Eyes. And upon farther Trial with a ſmall Feather ſtript of its plume, which ſhe thruſt up a hand's breadth or more, was ſo terrify'd at it as to conſult the Doctor and others about it, imagining nothing leſs than that it had gone to her Brain.

Tab. xviii Fig. i. K.

Lib. III. Part II. Cap. 1.

But they conſidering the Circumſtances of the matter, found that the Feather had doubled only in this Cavity, and gave the Lady full ſatisfaction in that point. The Doctor has given us a Figure of it, though no very exact one. Of this I have met with frequent Inſtances where the Patients have all done very well again, and the Aperture itſelf cloſed after Injecting a proper Medicine to cleanſe the *Antrum* from any offenſive Humour.

This Cavity or *Antrum Genæ* has a Communication, as the reſt have, with the *Foramina Narium*, with this difference; whereas thoſe are leſs Cavities, and all plac'd above the lower parts of the *Foramina*, and have large openings into the *Faramina Narium* from their lower-parts; Thoſe of the Cheeks are the largeſt of any about the Noſe, and have leſſer Apertures whereby they communicate with the *Foramina*; and theſe Small openings here are placed in the upper parts of theſe Cavities, though the lower parts of them are even with the lower parts of the *Foramina Narium*; by all which it appears with what difficulty any peccant Humour, lodg'd in either of theſe Cavities, can be diſcharg'd by the *Foramina Narium*, ſince theſe Cavities muſt either be fill'd to the top ready to run over firſt, or the Head muſt be held down to procure the diſcharge. This induced me to put in practice an Operation in the Cure of an *Ozæna*, which appeared reaſonable to me by the Structure of the Part, I being convinc'd it might be done without hazard to the Patient. After the foremoſt *Dens Molaris* was taken out, and not finding an Aperture from its *Alveolus* into this *Antrum*, which in other Inſtances I have ſeen happen, with a convenient Inſtrument I bor'd the hole of the *Alveolus* thro' into the *Antrum Genæ*, whereby the *Pus*, which before lay in the *Antrum*, readily ran out, and the

Tab. xviii. Fig. i.

Medicines that were daily injected by this Aperture, paſs'd into the Noſtrils, whereby the Patient was Cured, though this Diſeaſe had continued with a vaſt flux of ſtinking Matter daily from the Noſe, for more than Four Years before this Operation.

The Pituita *ſeparated.*

By ſmall Glands.

How ſeen.

I need not tell you how ſo much Matter could flow from this Cavity, when you conſider, that not only theſe Cavities of the Cheeks, but all thoſe of the Noſe, mention'd above, as well as the *Oſſa Turbinata*, *Septum Narium*, *&c.* are inveſted with a Membrane furniſh'd with large Arteries from the *Carotids* and Veins, that empty themſelves into the Jugulars and Nerves, from the *Par Quintum*, as well as the Olfactory Nerves. In this Membrane are a great Number of ſmall Glands placed very near each other. In an Oxe's-Head you may perceive the Orifices of their Excretory Ducts, by the appearances of the *Mucus* they diſcharge on preſſing this Membrane with the back of a Knife, *&c.* From theſe Glands flows all that *Pituita* that is commonly diſcharg'd at the Noſtrils.

The uſe of the Pituita.

The Uſe of this *Pituita* is to keep the Membrane ſoft, and defend it from the Injuries of Extraneous Bodies, eſpecially thoſe in the Air, which muſt paſs this way in Inſpiration, when the Mouth is ſhut. By this means the Olfactory Nerves expanded on this Membrane, are render'd capable of the perception of Odoriferous *Effluvia*, which otherwiſe the dryneſs of the part would deſtroy.

By this Plan we may gueſs the deſign of Nature, in framing ſo many Cavities, turnings and windings in the *Foramina Narium*, is to expand the Olfactory Nerves in ſo ſmall a compaſs, which are every where diſtributed in them, but particularly on the *Oſſa Turbinata:* And that Smelling is no otherways perform'd, than that by Inſpiration

tion the Odoriferous *Effluvia* of Bodies are brought to a Contact with the Olfactory Nerves.

Beſides this uſe of the Noſe, which is the principal; Nature has made it, as it were, a *Diverticulum* to the Eyes; for there's a conſiderable paſſage into each Noſtril, that empties it ſelf under the middle *Os Turbinatum*, which ariſes from two Apertures call'd *Puncta Lachrymalia*, a the great *Canthus* of each Eye. By this way the ſuperfluous moiſture of the Eyes is carry'd off, which would otherwiſe incommode the Cheeks, as you ſee it does when any diſorder affects theſe paſſages, as in the *Ægilops* and *Fiſtula Lachrymalis*.

While theſe Papers were Compoſing at the Preſs, a young Gentleman became my Patient, who had labour'd under an Apoſthemation in this *Antrum Maxillæ Superioris*, between four and five Years: I had ſeen him about a Twelve-month ſince, when I told him where the Seat of his Diſeaſe was; and the way I would take to Cure him, which he unluckily neglected: And notwithſtanding the Arguments uſed by an Ingenious and Learned Phyſician, as well as againſt his own Inclinations, he was at that time prevailed with to defer drawing his Tooth, (which I propoſed to him) till Time with the increaſe of his Malady, and a late Inſtance of Succeſs I had in the like Caſe, on a Perſon of the firſt Rank in Senſe as well as Quality, had confirm'd him of the neceſſity of doing it: By this time the Matter had of its ſelf made way by the fartheſt *Dens Molaris* of the left ſide, inſomuch that before the Tooth was drawn, I paſs'd a Probe by the ſide of it into the *Antrum*. The Day after the Tooth or Stump (for the greateſt part of it was mouldred away) was taken out, an ordinary Spoonful, at leaſt, of the worſt colour'd and ſcented *Pus* flowed at the Socket, on holding his Head back; I then Syring'd it with a proper Injection, which I continue daily, it now being but three Days ſince he told me he had very little uſe for his Handkerchief which he uſed to change five or ſix times in a Day for three or four Years before: On viſiting him the Seventh Day, when this Sheet came to be Revis'd, he told me, *To his Admiration, He was not only freed of the Flux at his Noſe, and violent Pains in his Head, particularly in his Eyes, but reſtor'd* (as he expreſs'd it) *to a perfect Tranquillity of Health.*

Here I muſt not omit the Caſe of an Elderly Gentleman, who had for a longer time labour'd under a diſcharge of a great quantity of Fœtid Matter from his Noſe; after I had told him how he might be relieved, he was by others laugh'd out of the Project (as they call'd it) till at length the thing it ſelf convinc'd him of the Truth of what I told him. When he conſulted me again, which was ſeveral Months after I firſt ſaw him, he then ſent for a Tooth-drawer to take out the Tooth I ſhould direct: Though the Operator attempted it with proper dexterity, not only the Tooth which appear'd ſound, (but was not ſo) on which he applied his Inſtrument, but the next Tooth alſo with their *Alveoli* or Sockets came away altogether; this frighten'd the Tooth-drawer, but I ſhew'd him it was none of his fault, but that the Corroſive Matter which had been ſo long ſuffer'd to lie on the Bone, had rotted it: In doing this the Patient did not complain of Pain, and was reliev'd of the Diſcharge at his Noſe, (the Matter finding a ready paſſage at the Breach) but was afterwards purſu'd with extravagant Pains in his Face and that ſide of his Head; and at length, after ſome Months, fell into Convulſive Diſorders, and Died.

On opening his Head I found the upper-part of the *Antrum* (between I, e, *. Tab. XVIII.)

Carious, and part of that Bone moulder'd away; but the *Caries* did not ſtop there, a *Sinus* being made through the Tract of the *Foramen Lacerum*, the oppoſite part of the *Os Sphenoides* was alſo Perforated, and the *Dura Mater* laid bare, and not Perforated; but on the contrary it was inflamed and very much thickned on that ſide the Head: I found an Apoſthemation in the Cortical ſubſtance of the fore-part of the hinder-Lobe of the Brain, of the ſame ſide though cover'd with the *Pia Mater*, in which was about an Ounce of Fœtid Matter. Tab. xv. B.

TAB. XVII.

FIG. I, II.

THE Muſcles and Cartilages of the *Alæ Naſi*, all as big as the Life.

AA, The *Muſculus Elevator Alæ Naſi*, in its natural Situation, Fig. I. and hanging down at its Termination, Fig. II.

a, A ſmall fleſhy Muſcle found in moſt Subjects, lying under the lower part of the former, ariſing from the ſecond Cartilage, and inſerted to the firſt that makes the *Ala Naſi*.

B, The *Muſculus Dilatator Alæ Naſi*, and *Elevator Labii Superioris*.

CC, Part of the Cartilaginous *Septum*, between the Cartilages of the *Alæ*.

D, The firſt proper Bone of the Noſe bar'd.

FIG. III.

THE Cartilages of the Noſe on the left ſide.

1. The firſt Cartilage that makes the *Ala Naſi*.

2, The ſecond ty'd to the firſt, by a Ligament, (*) the ſuperior edge of which (†) cleaves firmly to the Bones of the Noſe, Fig. II. D.

a, The little Muſcle expreſt, Fig. II. here pinn'd out.

b, Part of the *Muſculus Elevator Labii Superioris*, fix'd to the Cartilage of the *Ala Naſi*; which part of the Muſcle on each ſide makes that furrow from the *Septum Narium*, on the middle of the upper Lip.

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Tab. XVII.

Fig. I.

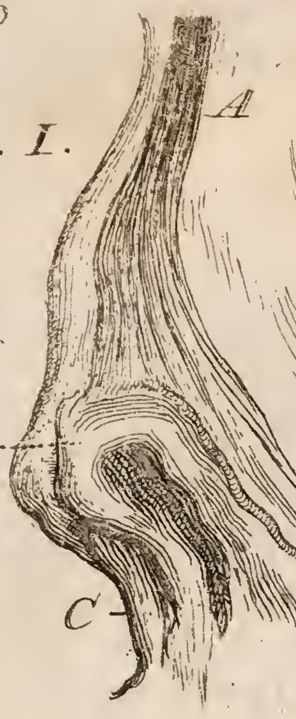


Fig. III.

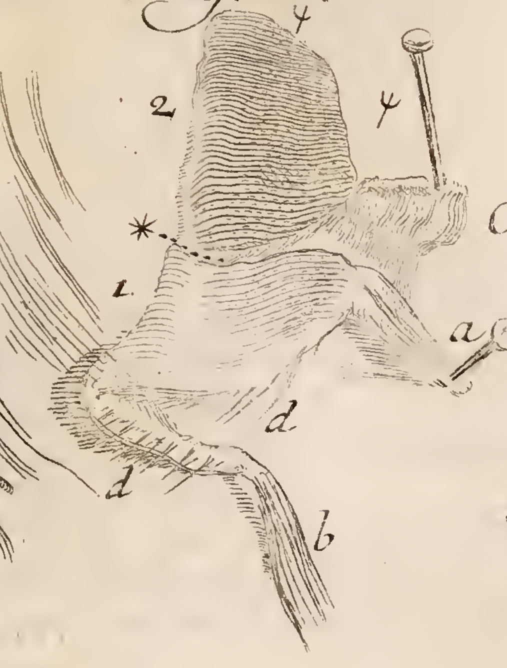


Fig. II.

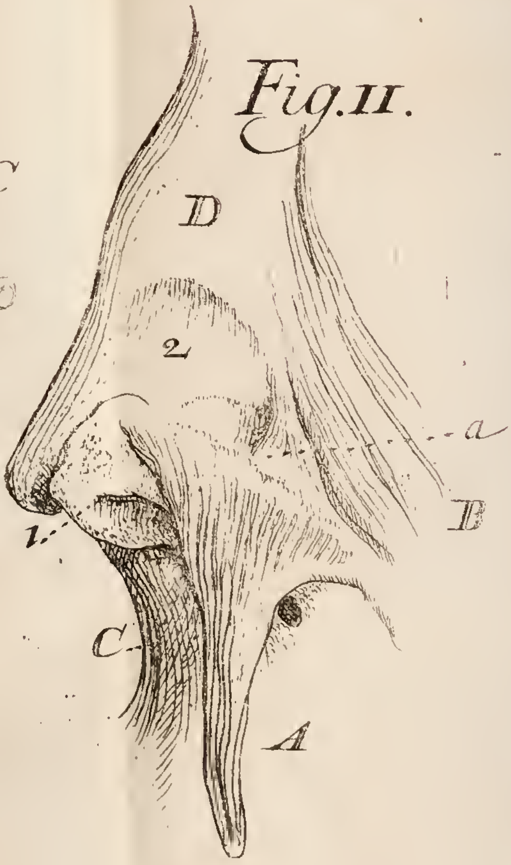


Fig. IV.

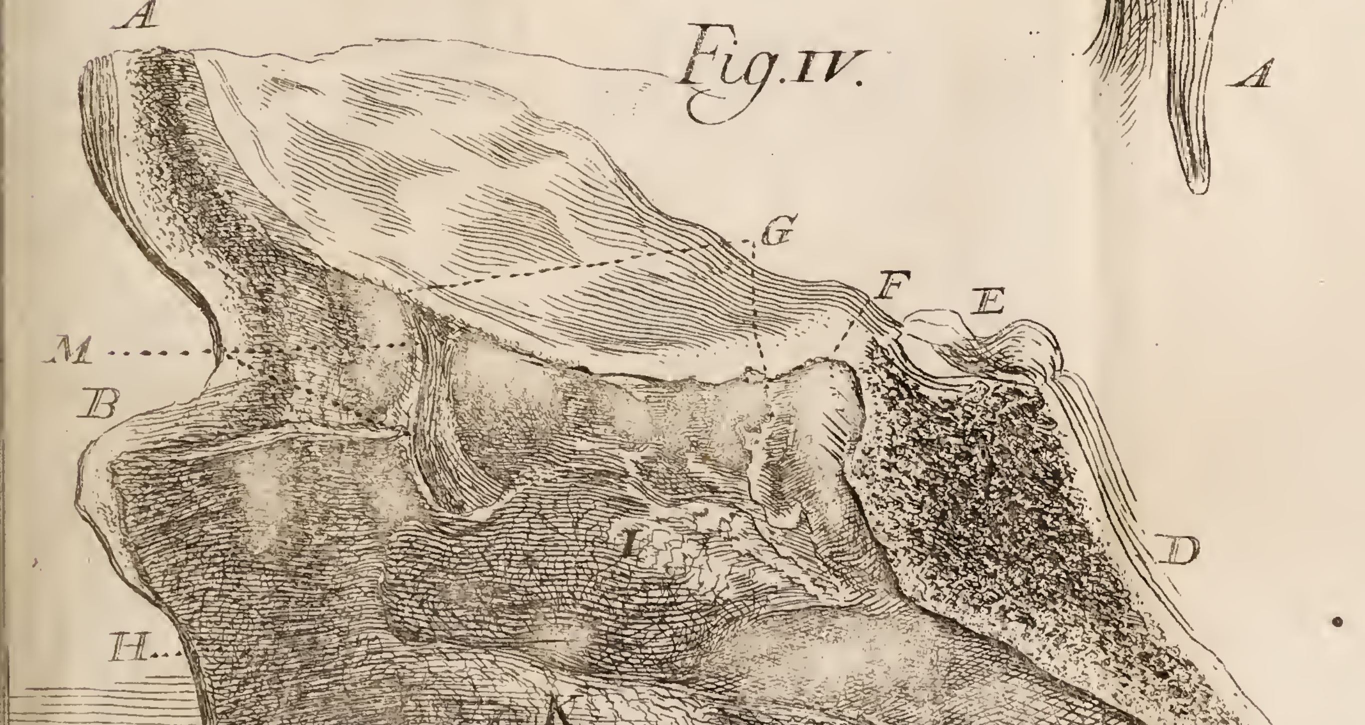


Fig. V.

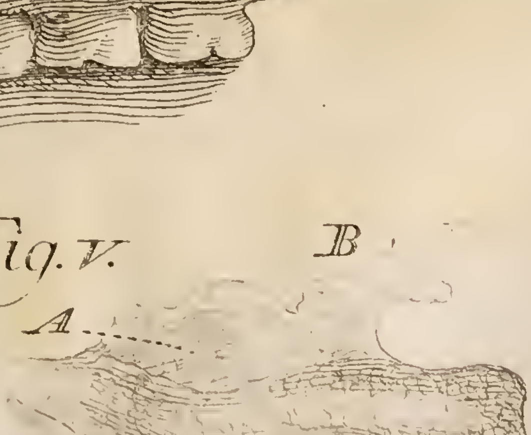
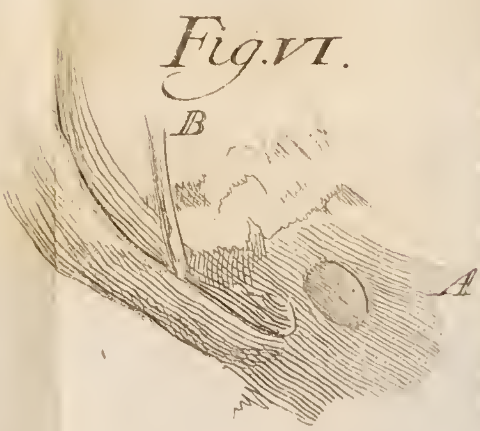


Fig. VI.



C, Part of the *Muſculus Dilatator Alæ Naſi*, and *Elevator Labii Superioris.*

dd, The Hairs of the Noſtrils ariſing out of the Cartilage of the *Ala.*

F I G. IV.

THE inſide of the right *Foramen* of the Noſe, as it appears in a Perpendicular Section of the Skull, through the middle of the *Os Frontis*, cloſe by the ſides of the *Criſta Galli*, and *Septum Narium*, with the *Os Palati*, and foremoſt *Dens Inciſorius* on the left ſide, as big as the Life.

A, The *Os Frontis* divided, which in this Subject had no Cavity that communicated with the Noſtril.

B, The Firſt proper Bone of the Noſe divided.

C, The Fourth Bone of the upper Jaw, and *Os Palati*, alſo divided, with the foremoſt *Dens Inciſorius.*

D, The Anterior *Appendix* of the *Os Occipitis* alſo divided.

E, The *Sella Turcica*, fram'd at the conjunction of the *Os Sphenoides* and *Occipitis.*

F, The *Cella Sphenoidalis* open'd.

G, The three or four other *Cells* of the *Os Sphenoides*, and Frontal Bone by the Orbit of the Eye; which alſo communicate with the *Foramen Narium*, and are all inveſted with the Pituitary Glandulous Membrane.

H, The Pituitary Glandulous Membrane covering the inſide of the *Foramen Narium* and its Cavities; particularly

I, The *Os Turbinatum Superius*, and

K, The *Os Turbinatum Inferius*, at the extremity of which next the *Fauces*, is

L, A Glandulous Body hanging looſe, and very much reſembling the *Uvula.* This becoming relax'd, whether by Ulcers, or Excoriations, in the neighbouring parts, or by Catarrhs, occaſions that fluttering Noiſe, which we hear in blowing of the Noſe, and ſometimes in ordinary Reſpirations.

a, Part of the *Proceſſus Pterygoides.*

M, A Chink, or Furrow, which paſſes under the forepart of the *Os Turbinatum Superius*, into which opens one of the Perforations from the *Antrum Maxillæ Superioris*, expreſs'd Tab. XVIII. Fig. I. L. in the lower part of which Chink in this Subject, was the Aperture to that *Antrum*, expreſs'd Fig. VI. By a Probe paſſing through it. B.

FIG. V.

THE inſide of the *Os Turbinatum Superius*, expreſs'd at I, Fig IV. cover'd with its Glandulous Membrane.

A, A Cavity or Depreſſure of this Bone oppoſite to the *Foramen* expreſs'd at A, Fig VI.

B, The upper-part of the *Os Turbinatum*, which adhered to the ſides of the *Cells* G, Fig. IV.

FIG. VI.

THE two Apertures from the *Antrum Maxillæ Superioris* into the *Foramen Narium*, of the right-ſide, as they appear when the *Os Turbinatum Superius* (marked I, Fig. IV.) is removed.

A, The Poſterior, or largeſt Perforation that opens againſt the Cavity, or Cell of the *Os Turbinatum*, Fig. V. A.

B, The end of a Probe paſſing out of the foremoſt and leſſer Perforation in the Chink, at M, Fig. IV.

TAB. XVIII.

FIG. I.

THE right-ſide of the Skull with its *Baſis* turn'd ſomewhat upward, the better to ſhew the *Antrum Maxillæ Superioris*, which is here open'd after ſawing off the lower part of the Cheek Bone, as big as the Life.

A, The *Os Frontis*.

B, The *Bregma*.

C, The Occipital Bone.

D, That part of the *Os Temporum*, call'd *Os Squammoſum*.

E, That part of the *Os Sphenoides*, that is touch'd by the *Os Frontis*, *Bregma* and Squammous part of the Temple-Bone.

aa, The *Sutura Coronalis*.

bb, The *Lambdoides*.

cc, The *Squammoſa*.

F, The Cheek-Bone reckoned the firſt of the upper-Jaw.

×× Its lower-ſide ſaw'd off, in order to ſee the *Antrum Maxillæ Superioris*.

G, The Second Bone of the upper-Jaw call'd *Os Lachrymale*, *Os Unguis*, &c.

H, The firſt proper Bone of the Noſe.

IIII, The Fourth Bone of the upper-Jaw, in which is,

K, The

Fig. II.

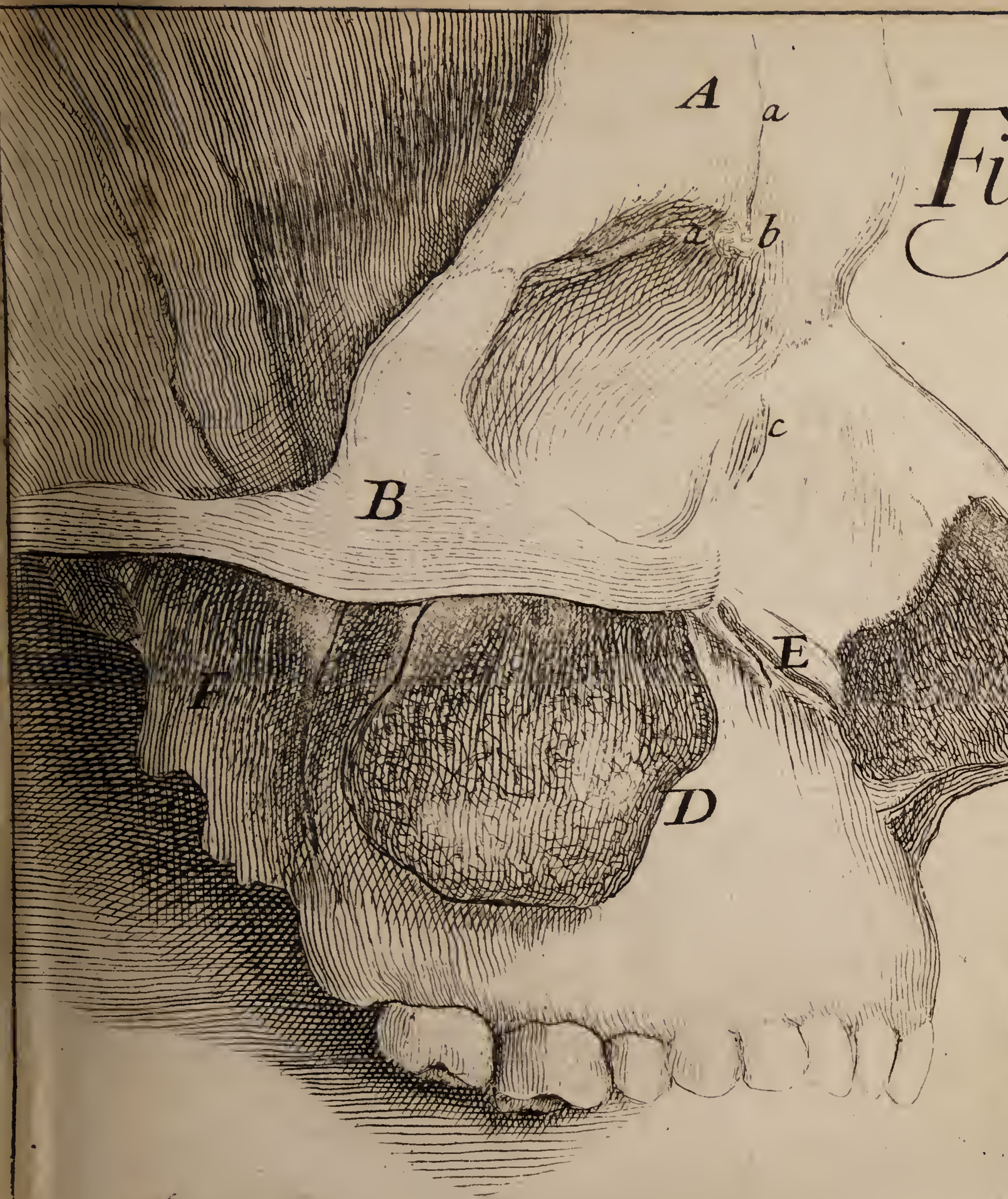


Fig. I.

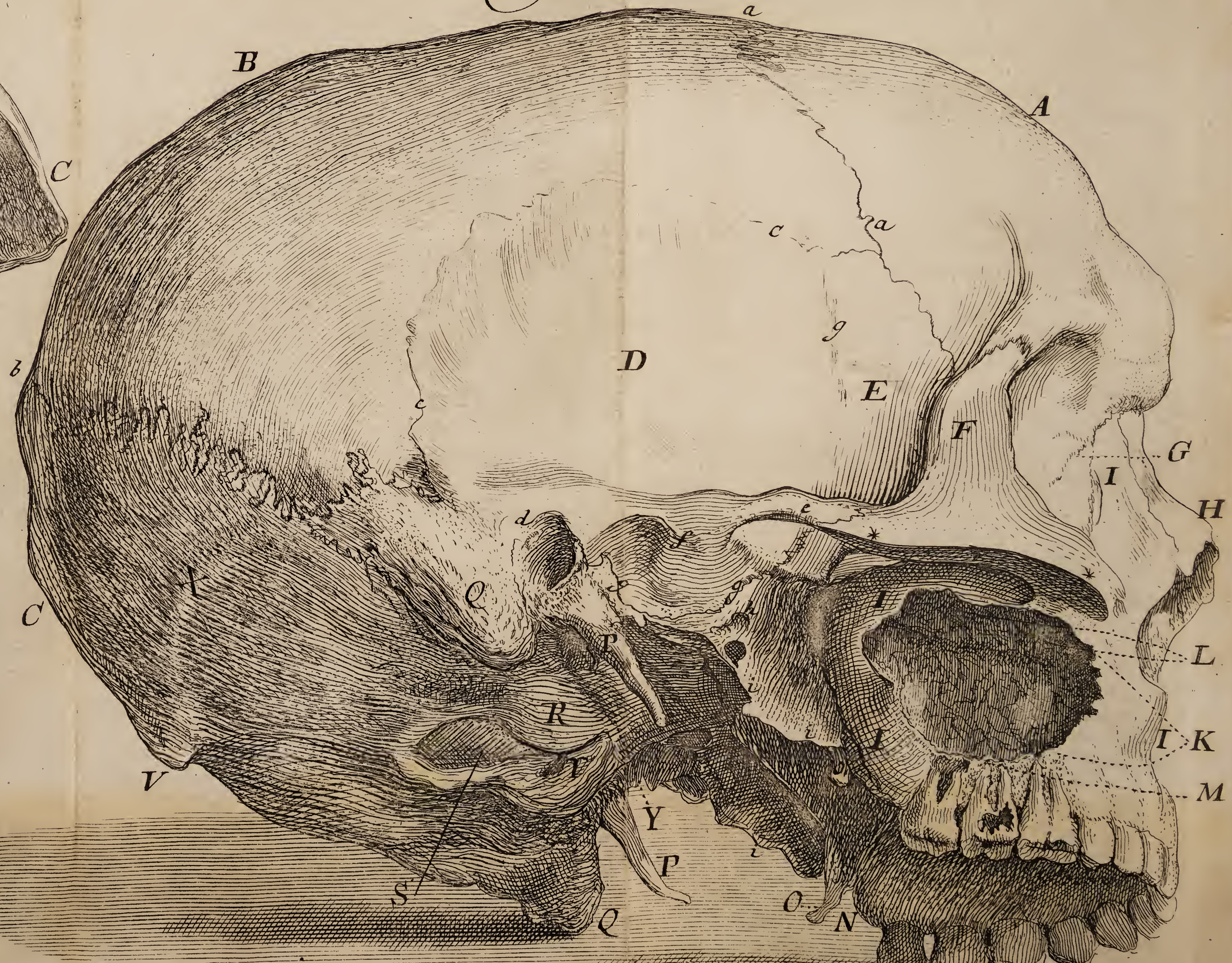
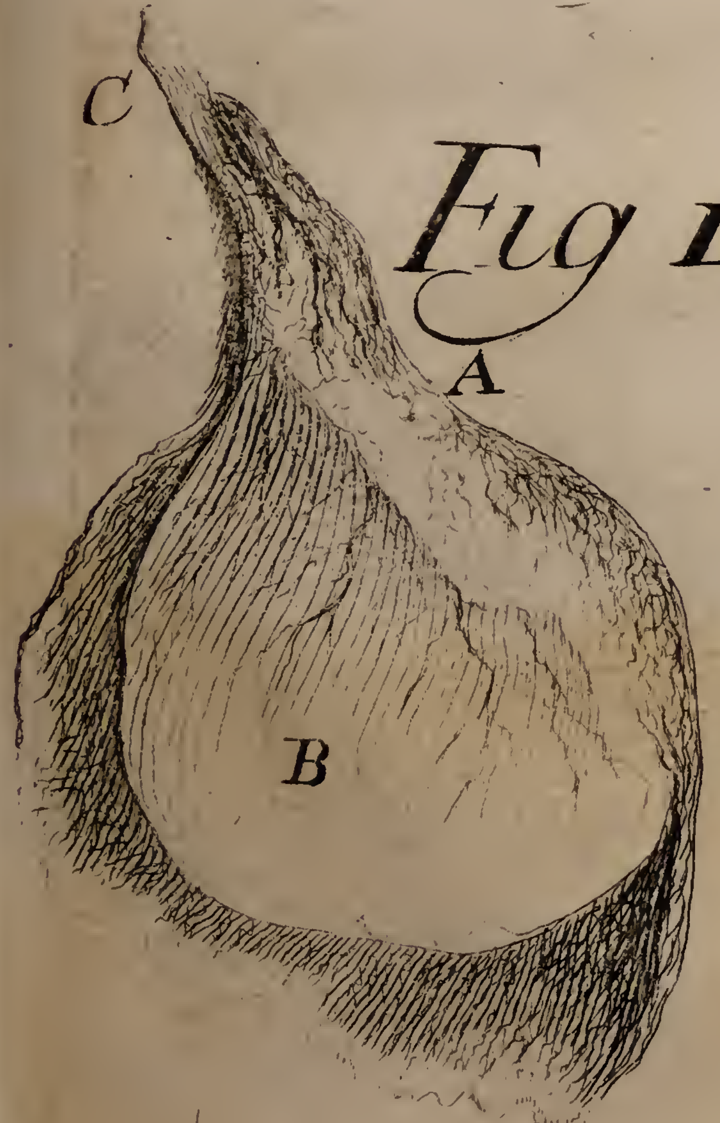


Fig. III



K, The *Antrum Maxillæ Superioris*, whoſe external Surface is here remov'd, to ſhew the Glandulous Membrane that lines its inſide, in which its numerous Blood-Veſſels appear: And,

L, Two *Foramina* in its upper part, which open into the *Foramen Narium* of that ſide, as expreſs'd in the preceding Table, Fig. VI. AB

M, The thickneſs of the ſides of the *Antrum*, above the Roots of the ſecond *Dens Molaris*.

N, Part of the *Os Palati*.

OO, The *Proceſſus Pterygoides*.

P P, The *Proceſſus Styloides*.

Q Q, The *Proceſſus Maſtoides*.

R, The external Surface of one of the Proceſſes of the Occipital Bone, which is articulated with the firſt *Vertebra* of the Neck, on the right ſide.

S, The hole in the Occipital Bone, by which the *Medulla Oblongata* paſſes out of the Skull.

T, The internal Aſpect of the left occipital Proceſs, that is received in a correſponding Depreſſure of the firſt *Vertebra* of the Neck. The Perforation here expreſs'd ſerves for the Tranſmiſſion of one of the ninth Pair of Nerves.

VX, A Prominence and riſing Seam in the Occipital Bone, at the Termination of the Muſcles of the Head, to which the *Ligamentum Colli* is fix'd at V. This, in ſome Skulls, is much larger than here expreſs'd; in others you will find no Prominence in this part of the Bone.

Y, The *anterior Appendix* of the *Os Occipitis*, to which the *Muſculi Annuentes* and *Flexores Capitis* are inſerted.

d, The *Meatus Auditorius*.

e, The *Os Jugale*, compoſed by a Proceſs of the *Os Temporale*, and firſt Bone of the upper Jaw.

f, A ſhallow Depreſſure of the *Os Temporum*, in which a moveable Cartilage is placed for the Articulation of the lower Jaw.

ggg, The Suture of the *Os Temporum*, with the *Os Sphenoides*.

h, A Perforation by which a Branch of the fifth Pair of Nerves paſſes the *Baſis* of the Skull, reckon'd the third Perforation of the *Os Sphenoides*.

iii, The *Alæ*, or Wings of the *Os Sphenoides*, call'd *Pterygoides*, from the external Surface of which (here expreſs'd on the right ſide) the *Muſculus Pterygoideus Externus* does ariſe; as does the *Muſculus Pterygoideus Internus*, from the internal Surface of this Proceſs, here ſeen on the left ſide i.

FIG. II.

A Side-view of part of the Bones of the upper Jaw, and Noſe, after the lower part of the Cheek-Bone was ſaw'd off to diſcover the *Antrum Maxillæ Superioris*; the Cartilages of the Noſe, expreſs'd Fig. III. in the preceding Table, being remov'd to ſhew the *Septum Narium*: Drawn from a diſeas'd Body that died emaciated.

A, The *Os Frontis* bared.

B, The Cheek-Bone, or firſt Bone of the upper Jaw.

C, The cartilaginous part of the *Septum Narium*, cover'd with its Glandulous Membrane, full of Blood-Veſſels.

D, A *Cyſtis*, or Glandulous Bag, diſtended with mucous Matter, which fill'd the *Antrum*.

aa, A Branch of an Artery fill'd with Wax, paſſing to the Forehead.

b, The *Trochlea*, or little hollow Cartilage, through which the Tendon of the *Muſculus Obliquus ſuperior Oculi* paſſes.

c, The *Foramen* compos'd by the ſecond and fourth Bone of the upper Jaw; by which the ſuperfluous Moiſture of the Eye is convey'd to the *Foramen* of the Noſtril.

E, The Branch of an Artery with one of the fifth Pair of Nerves, paſſing out at a Perforation in the fourth Bone of the upper Jaw.

F, The *Ala* of the *Os Sphenoides*.

FIG. III.

THE *Cyſtis*, expreſs'd at D in the preceding Figure, taken out, fill'd with the mucous Humour.

A, Its external Glandulous Membrane, full of Blood-Veſſels.

B, Its middle Membrane with fewer Blood-Veſſels, beſides which it had an Internal tranſparent Membrane, like the *Tunica Allantoides*, in which the mucous Humour was contained.

C, Its Root or *Pedunculus*, by which it grew to the upper part of the *Antrum*.

After this *Cyſtis* was remov'd, it was remarkable that the Cavity of the *Antrum Maxillæ Superioris* had ſtill a Membrane, tho' thinner than is natural, that inveſted it.

N. B. Had theſe *Antra* of the upper Jaw been oftner look'd into, I am apt to think they would have been found the Seats of other Diſorders; perhaps of the Catarrh, and particularly the *Catarrhus ſuffocatorius* of the Ancients, which they thought proceeded from the Brain.

CHAP. XI.

Of the Eyes.

JUST above the ORBIT, or hollow in which the Eye is receiv'd, externally appears the Eye-brow, in form of a Segment of an *Ellipſis* cover'd with Hair, which ſprings from ſome Glands and Fat placed betwixt the Skin and *Panniculus Carnoſus*, upon the upper edge of the Bone, and is contriv'd by Nature to arreſt the Courſe of Sweat, and keep it from falling into the Eye. Supercilium.

From hence is immediately continu'd a Muſcular Membrane, which with the Skin makes the upper Eye-lid, and is anſwer'd on the lower part by another of the like Figure and Structure, which together ſerve to cover and defend the Eye in the time of Sleep, and upon other Occaſions. Palpebræ.

Both upper and under Eye-lid are fring'd with Hair, eſpecially the upper, which is larger and ſtiffer than that of the under, and ſeems to be a Contrivance to break the too fierce Impreſſion of the Rays of Light; as likewiſe to keep out Flies and Moats, and other things that float in the Air, which annoy the Eye. Cilia.

Theſe Hairs ſpring from a ſmall row of Glands, which cover a thin, tender Cartilage, which edges each Eye-lid, and ſerves as a kind of a Ring to ſtretch them upon. *Cartilage.*

Theſe Eye-lids are both moveable, eſpecially the upper, which has two Muſcles to raiſe and depreſs it, which are call'd *Attollens* and *Deprimens*. The firſt of which ariſes from the bottom of the Orbit of the Eye, near the entrance of the Optick Nerve, where it is tendinous, ſoon grow- *Muſcles.* Attollens App. Tab. xvii. Fig 6 ing fleſhy afterwards, and with a broad thin Tendon terminating in the upper Eye-lid.

Deprimens *or* Orbicularis. Tab.xxiii. Fig. ii.

The Depriment ſprings from each corner of the Eye, and is anſwer'd by another of like Figure and Structure in the lower Eye-lid; which are therefore often conſider'd together by Anatomiſts, as one Orbicular Muſcle. It is a fleſhy Muſcle, whoſe Fibres environ the Eye-lids, and are inſected into them, not unlike the Sphincters of other parts. It is faſtned to that part of the Margin of the Orbit, towards the Noſe, which is made by the fourth Bone of the upper-Jaw.

Beſides theſe Muſcles, the Eye-lids are mov'd ſecondarily by others. The upper being retracted by the Muſcles of the Forehead, and the lower by thoſe that move the Lip and under-Jaw.

Verheyen's *Muſcle.*

Verheyen has obſerv'd a ſmall Muſcle, which ariſes from the firſt Bone of the upper-Jaw, and terminates in the Carnous or Muſculous part of the lower Eye-lid.

Membranes.

The inſide of the Eye-lid is lin'd with a thin, fine, ſmooth Membrane from the *Pericranium*; and the outſide is protected by the common Coverings of the reſt of the Face, the Cuticle and Skin.

Canthi. App. Tab. xvii. Fig. i.

At the commiſſure or joining of the Eye-lids, are form'd two Angles or Corners, of which the inner (that next the Noſe) is call'd *Canthus Major*, the other *Minor*. In the former of which lies a ſmall Gland of an oblong Figure, which is call'd *Glandula*, or *Caruncula Lachrymalis*, tho' perhaps improperly. From this Gland proceed two or three ſmall Ducts, which opening upon the inner Surface of the Eye-lid, ſerve to moiſten the Globe of the Eye, and keep its Membranes from growing too dry. In this corner of the Eye are two ſmall Perforations which are call'd *Puncta Lachrymalia*, which open and diſcharge th

Glandula Lachrymalis. App. Tab.xvii. Fig. v.

Puncta Lachrymalia. Ib. Fig vi.

the ſuperfluous Moiſture of the Eyes into the Noſe, through a large excretory Tube.

Glandula Innominata. Ib.Fig.i.

On the upper part of the Ball of the Eye, near the leſſer or external *Canthus*, lies a large Gland call'd *Innominata*, which conſiſts of ſeveral ſmall Lobes; each of which ſends out a Duct, by ſome Branches of which the Eye is irrigated, and the overplus of the Humour carried to the greater *Canthus*, and tranſmitted to the Noſe thro' the *Puncta Lachrymalia.* From theſe Glands proceeds that Humour which forms the Tears

Parts of the Eye.

The Eye is of a Globular Figure, and conſiſts of Membranes, Veſſels, and Humours. It is cloath'd in ſome Parts with Fat, and mov'd by Muſcles; which two latter are, by moſt Anatomiſts, numbred among the conſtituent Parts, tho' improperly.

Muſcles.

App. Tab.xvii. Fig. iv.

To the Eye belong ſix Muſcles, by means of which it enjoys various Motions; of theſe, four are from their Situation call'd *Recti*, or ſtraight Muſcles, coming from ſeveral Points of the bottom of the Orbit, and running immediately over the firſt proper Tunic of the Eye, between that and the *Adnata.* Theſe Muſcles have from their ſeveral Offices ſeveral Names; one being call'd *Attollens*, becauſe it draws the Eye upwards; another *Deprimens*, from pulling it downwards; the third *Adducens*, which draws the Eyes towards the inward *Canthus*; and the fourth *Abducens*, from its forcing towards the outward *Canthus*.

Attollens. Deprimens. Adducens. Abducens.

Obliqui ſeu Rotatores.

Tab. xviii Fig. ii.vi. Trochlearis.

Beſides theſe, there are two other Muſcles, which are called the Oblique; of which the upper ſpring from the ſame Origine with the *Adducens*; from whence tending upwards towards the inward *Canthus* of the Eye, it paſſes through a Cartilage on the Bone of the Forehead, which is call'd *Trochlea*, and the Muſcle it ſelf *Trochlearis.* From this *Trochlea* it is reflected to its Termination in the *Tunica Sclerotis*, directly between the Termination of the *Attollens* and the Optick Nerve, which is on the back-part of the Ball of the Eye. When this Muſcle acts, that part of the Ball of the Eye, drawn towards the *Trochlea*, whereby the Pupil is directed downwards towards the leſſer *Canthus*, and at the ſame time the whole Ball of the Eye drawn ſomewhat outwards.

Obliquus Inferior. The lower oblique Muſcle riſes from the external Margin of the lower part of the Orbit near the inward *Canthus*; and from thence running toward the outward *Canthus*, terminates near the other, behind the Termination of the *Abducens*. This draws the Ball of the Eye outwards, and turns its Pupil upward, contrary to the former.

Fat. Between theſe Muſcles lies the Fat interſpers'd, which ſerves to lubricate and facilitate their Motion.

Tunica Adnata. App. Tab. xvii. Fig. iv. H H. Over all theſe Muſcles is ſpread a pretty thick white Membrane, which is call'd *Tunica Adnata* or *Conjunctiva*, and makes that which is commonly call'd the White of the Eye.

This Membrane covers the whole Ball of the Eye, except the fore-part, which is call'd the Sight. This is not number'd among the proper Tunicks of the Eye. It is extreamly ſenſible, and abounds with Veins and Arteries, which are very viſible in Opthalmies or Inflammations of the Eyes.

Three proper. There are three other Membranes proper to the Eye, of which ſome Anatomiſts make five. The firſt of theſe is a pretty tough Membrane deriv'd from the *Dura Mater*, which paſſes to the Eye from the Brain, along with the Optick Nerve, and is from thence propagated over the whole Globe of the Eye, and is on the fore-part, which covers the Sight, tranſparent, which has

Sclerotica Ib. Fig. x.

given Anatomiſts occaſion to make two Membranes of it, and to call the tranſparent part *Cornea*.

Cornea.

Choroides. App. Tab. xvii.

The ſecond is deriv'd from the *Pia Mater*, and tranſmitted likewiſe from the Brain, along with the Optick Nerve. This is much thinner and tenderer than the former; and ting'd on the hinder-part with a black Liquor, ſeparated from the Blood-Veſſels, with which it abounds. The fore-part of this is as the former, tanſparent, but thinner; and is by Authors reckon'd as another Tunic, and call'd *Uvea*.

Uvea.

Iris. Ib.

Pupilla.

Ligamentum Ciliare. Ib. Fig. viii

Of the Duplicature of this part of the Membrane, is form'd that ſtriped variegated Circle which is call'd the *Iris*, which is in ſeveral Subjects of different Colours. In its middle is a Perforation, thro' which appears that little black Speck, which is the Sight, or Pupil of the Eye, about which the *Iris* forms a Ring. From the inſide of this Membrane ſpring certain Fibres, which ſpread themſelves round the Cryſtalline Humour, and ſerve to contract or dilate the Sight as Occaſion requires, and are call'd *Ligamentum Ciliare*. From the blackneſs of the hinder-part of the *Tunica Choroides*, the tranſparent Humours of the Eye derive that ſeeming blackneſs which appears in them.

Retina.

The third Tunic, which ſome reckon the ſixth, (numbring the *Adnata* among them) is the *Retina*, which is only a kind of Net-work Expanſion of the Medullary Subſtance of the Optick Nerve, and is ſpread only on the bottom of the Eye, oppoſite to the Sight, and is the proper Organ of Viſion.

Humours of the Eye. Aqueus.

Between theſe Coats are contain'd three Humours: The firſt of which is called the Aqueous, becauſe in its Conſiſtence and Colour it ſomewhat reſembles Water, being almoſt equally limpid and tranſparent. This Humour lies immediately under the *Cornea*, which it cauſes to protuberate a little. The learned Dr. *Nuck* (that inquiſitive Anatomiſt) pretends to have diſcover'd ſome Ducts which convey this Humour to the inſide of this Membrane, which diſcovery has however been conteſted. The Author is notwithſtanding ſo ingenuous as to own, that by whatever Enquiries or Experiments he could make, (in which he was uſually very happy) he could never trace theſe Ducts to their Source. Some (who will not allow theſe Ducts) would have this Humour to be deliver'd immediately from the Arteries, becauſe they cannot find from whence it ſhould come, which is an Opinion contrary to the Method of Nature in other Separations. But if a Conjecture may be allow'd in this Caſe, believing *Nuck*'s Diſcovery to be real, it is not improbable that theſe aqueous Ducts are only Branches of the excretory Ducts of the *Glandula Innominata* and *Lachrymalis*, which piercing the Tunics of the Eye, deliver their Liquor by ways hitherto undiſcover'd. This only is certain, that they muſt have ſome conſiderable Source; becauſe, if by any Accident the Tunic of the Eye be wounded, and the Humour runs out, as it readily will; by mere cloſing of the Eye the Wound is ſoon heal'd, and the Humour recruited; which cannot naturally be expected from the Arteries, without ſome intermediate Organ of Separation; which Organ has not yet been elſewhere diſcover'd.

Ductus Aquoſi Nuckii.

The Cryſtalline Humour, improperly ſo called (becauſe it is not fluid) is in Man of a flattiſh Convex on both ſides, approaching to a circular Figure, but a little more Convex on the hinder than the fore-part.

Cryſtallinus. App. Tab. xviii Fig. i, ii, iii.

Next under this lies the *vitreous* Humour, ſo call'd from the ſuppos'd Reſemblance of melted Glaſs. The fore-part of this Humour is Concave, occaſion'd

Vitreus.

occaſion'd by the Impreſſion of the Cryſtalline upon it. On the hinder-part, almoſt of a ſpherical Convexity.

Some Authors, finding theſe Humours cover'd by Membranes, have given diſtinct Names to them, and ſo encreas'd the Number of Coats to nine. But theſe being only Productions of thoſe already mentioned, it is not neceſſary to perplex the Reader with needleſs Diſtinctions.

Optick Nerves.

Behind all theſe Coats and Humours, thro' a Perforation of the Skull in the hinder-part of the Orbit, the Optick Nerve enters the Eye; which has been already deſcribed: As have likewiſe the other Nerves, ſerving for the Motion of the Eye.

Arteries, Veins.

It receives Arteries both from the internal and external *Carotis*, and returns the Blood by Veins that go to the Jugulars.

CHAP. XII.

Of the EAR.

Auricula Auris.

Tab. xix. Fig. i.

THE Ear is generally divided into external and internal. The firſt of which, comprehending all that is prominent from the Head, and the Cavity on the inſide of it, is call'd the Auricle. The inner part, which enters the Skull by a narrow paſſage, is in a reſtrain'd Senſe alone call'd the Ear.

Pinna. Helix. Anthelix. Tragus. Antitragus. Concha.

The upper part of the Auricle is call'd *Pinna*, and ſometimes *Ala*. The whole Extent of the Auricle outwards is call'd *Helix*, and the inward Protuberance anſwering to it is call'd *Anthelix*. The little Protuberance of the ſide next the Face is call'd *Tragus*; and the Ridge juſt above and oppoſite to it, is *Antitragus*; and the Hollow, ſurrounded by theſe, is call'd *Concha*. Theſe are Particularities which ſome Authors have been very exact in, to no great uſe or purpoſe.

Conſtituent Parts. The Auricle is compos'd of the Cuticle, the Skin, (which in this part is very thin) a Cartilage, a little Fat, a Pair of Muſcles and Veſſels.

The *Cuticula* has no Difference from that of other Parts. In a *Fœtus* it is continu'd within the *Meatus*, over the *Membrana Tympani*, whence it falls off ſome time after the Birth; if it remains, it not only hinders the Excretion of the Ear-wax, but occaſions Deafneſs till it's remov'd. An Inſtance of which I ſaw in a Girl about eight Years old, who was ſaid to be born deaf, but recover'd her Hearing on the coming away of this Membrane: Its uſe is in the *Fœtus*, to defend the *Membrana Tympani* from the Contents of the *Amnios*.

Muſcles. Tab. xix. Fig. 1. The Cartilage is the *Baſis* and Support of the whole; and tho' it be furniſh'd with two Pair of Muſcles, yet theſe are in Men ſo ſmall, that the Auricles are ſeldom moveable; and that in ſome of thoſe only who move the whole Scalp. The ſuperior of theſe is from its Poſition, rather than manifeſt Action, call'd *Attollens*, which in truth is no other than a part of the Muſcle of the Scalp, (of which hereafter) with ſome fleſhy Fibres in it, as it deſcends over the temporal Muſcles to the upper part of the *Concha*. Beſides this, Diſſection diſcovers another parcel of fleſhy Fibres, which in ſome Bodies are divided into three diſtinct Muſcles, ariſing from the *Os Temporale* above its mamillary Proceſs, and are fix'd to the hinder part of the *Concha*. To theſe a late Author, *Valſalva*, adds another new Muſcle, as he affects to call it, ſpringing from the fore-part of the Membrane of the temporal Muſcle, and inſerted to the fore and upper part of the Ear. But this, and two other Muſcles, which he calls *Muſculus Tragi*, and *Muſculus Antitragi*,

Attollens.

Retrahens

titragi, ſeem to be more the Effect of Fancy than any real Exiſtence in Nature. He tells us of a new Ligament of the Auricle, that ties the cartilaginous part of the *Meatus* to the Temple-Bone, near the riſe of the *Proceſſus Zygomaticus*. The Blood is ſent to theſe Parts by Branches of the Carotids, and is reconvey'd by the external Jugulars. *Ligament.*

The Nerves are of two ſorts: The firſt is from the hard Portion of the auditory Nerve, marching out by that Perforation in the Skull, call'd *Aquæductus Fallopii*, beſtows Branches on the fore-part of the Auricle, and its *Meatus*, before it is ſpread into the parts of the Face. The ſecond ſprings from between the firſt and ſecond *Vertebra* of the Neck; whence deſcending, it ſends a Branch to the Muſcles of the Neck, and another to the lower Jaw, and parotid Gland; but its main Trunk aſcending again, beſtows Branches on the back-part of the Auricle, before it paſſes to the top of the Scalp. This Branch of it goes to the Auricle, and is burnt for the Tooth-ach, *vid. Tab. xix. Fig. i. H.* *Nerves.*

The uſe of the Auricle is to collect Sounds. But whether thoſe Men that have the Faculty of pricking up their Ears, are quicker of Hearing than other Men, I can't determine, tho' it ſeems probable that they ſhould; and it is obſervable, that all who have that Faculty have large Auricles. *Uſe of the Auricle.*

Behind, and about the Auricles, under the Skin, are ſituated divers Glands, which from their Place are call'd *Parotides*. Two of which being more conſiderable than the reſt for their Magnitude, are generally underſtood by that Name. Theſe are conglomerate, and by divers excretory Veſſels, which at laſt coaleſce into one Trunk, diſcharge their Liquor into the Mouth, at the inſide of the Cheek, by the ſecond grinding Parotides.

Tooth. Near theſe are two other Conglobate Glands, which being leſs, are in a manner obſcur'd by them.

Auris. Alvearium. The bottom of the *Concha*, or hollow of the Auricle, which is call'd by ſome *Alvearium*, terminates at the *Meatus auditorius*, which is the entrance of the *Auris* or Ear, ſtrictly ſo call'd.

Meatus Auditorius. The exterior part of this *Meatus* is Cartilaginous, tho' not ſo in all parts, eſpecially the upper. This Cartilage is irregularly divided with fleſhy membranous Interpoſitions in ſeveral parts of it, not unlike the *Bronchia* in the Lungs, only its fleſhy Fibres are here thicker. The inner part, or that which is neareſt the Brain, is bony. It is lin'd throughout with a thin Membrane, deriv'd from the Skin, which is continu'd on the *Membrana Tympani*, where it becomes thinner. Pili. From the beginning of the *Meatus*, near half way, ariſe a great number of ſmall Hairs, at whoſe Roots iſſues the Ear-Wax, which is intangled in thoſe Hairs, the better to infringe the *Impetus* of the external Air, and prevent its too ſuddenly ruſhing in on the *Membrana Tympani*. Under this is a reticular Body, in whoſe *Areæ* are plac'd the Glands that ſeparate the Ear-Wax.

Glandulæ Ceruminoſæ. Tab. xix. Fig 1. R. Theſe Glands are round, and ſomewhat flattiſh, and of oval Figures, and have a brighter yellow Colour than the Wax they ſeparate. Their excretory Ducts diſcharge themſelves at the Roots of the Hairs above mentioned.

Cerumen, *Its Uſe.* The Uſe of the *Cerumen*, or Ear-Wax, is not only to defend the *Meatus*, and *Membrana Tympani*, from external Injuries, whether from the outward Air or other extraneous Bodies; but it prevents any violent *Impetus* in Sounds on the *Membrana Tympani*, as above-noted.

The Courſe of this *Meatus* is winding, turning ſometimes upwards, ſometimes downwards, but always bending towards the Face.

Tympanum, *or* Membrana Tympani.

This Paſſage is clos'd inwardly by a thin tranſparent dry Membrane, ſtretch'd upon a Bony Circle, and is call'd *Membrana Tympani*, and improperly *Tympanum*.

The Organ of Hearing.

This is the immediate Organ of Hearing, and if by any Accident it happens to be broken, Hearing is utterly deſtroy'd: If by too much Moiſture, whether from the Glands, or from Impoſtemation, or other Chance whatſoever, it is relax'd, the Hearing is vitiated, and becomes defective: As on the other hand, when it is too Tenſe, (as ſometimes in Fevers, and Inflammations of the Ear it happens to be) that Senſe becomes acute, even to a Grievance.

Tympani

This Membrane divides the External from the Internal *Auris*.

Situs Figura. Tab. xix. Fig. 1. T.

The Situation of this Membrane, with reſpect to the erect Poſture of the Body, is oblique, facing downwards, whence it is we better hear Sounds that come from below, than thoſe from above: Its external Surface is a little hollow'd in its Middle, by the Handle of the *Malleus*, and conſequently its Internal next the Cavity of the *Tympanum* is Convex in its Centre. 'Tis ſaid to be compos'd of two Membranes, which perhaps may be no more than the condition of all other Membranes, *i. e.* conſiſting of divers *Lamellæ*, that may be divided into two, three or more, as the Part happens to be charg'd with any extravaſated Humour. However 'tis pretended, that one of theſe Membranes is continu'd from the *Dura Mater*, that paſſes through the Commiſſure, between the *Os Temporale and Petroſum*.

Foramen Membranæ

The *Membrana Tympani* has a Perforation that admits of the Paſſage of Wind, and in ſome

Smoke from the *Meatus à Palato* to the *Tympanum*; This Paſſage is very ſmall, and runs obliquely from the *Tympanum*, through its Membrane in its upper part, near the Proceſs of the *Malleus*: The exiſtence of this Perforation is more evident by the egreſs of Wind, (when Ulcers affect the *Meatus* by the Patient's ſtopping his Noſe and Mouth, and forcing the Wind by the Ears and in Smokes coming that way) than by any Anatomical Inſpection. But in ſome Subjects it has been ſeen by blowing into the *Meatus à Palato*.

Tab. xix.

Veins.

The *Membrana Tympani* has Arteries from the *Carotides* and Veins, which empty themſelves into the *Diverticulum* of the Internal Jugular. It has a remarkable Branch of a Nerve that paſſes on its internal Surface between the *Incus* and *Malleus*, which is call'd CHORDA TYMPANI; of the diſtribution of this Nerve, (which is a Branch of the hard Portion of the Auditory Nerve) we ſhall ſpeak in the particular Place.

Chorda Tympani.

Meatus Internus. Oſſicula Muſculi.

Behind this is a Cavity or hollow of the *Os Petroſum*, by ſome call'd *Meatus Auditorius Internus*, by others *Concha Interna*, *Tympanum* and *Tympani Cavitas*.

Meatus. Feneſtræ.

In this Cavity are four little Bones, to which belong three Muſcles, two *Meatus*'s or Paſſages, and two Apertures call'd *Feneſtræ*.

Malleolus.

The firſt of theſe little Bones is call'd *Malleolus*, or the Hammer, conſiſting of a Head and Handle. The Head being round, is Articulated with the *Incus*; it has two little Proceſſes; that towards the *Tympanum* is ſhort, the other is very long and ſlender; to the former is faſtned a ſmall Muſcle, which is call'd *Externus*, and coming from the ſide of the *Meatus* to the Short Proceſs of the *Malleus* draws the Handle of it downwards, by which the *Tympanum* is relax'd, and thereby

Tab. xix. *Muſcles External.*

prevents its being broken by the violent concuſſions of great Noiſes.

Du Verney's *Muſcle of the* Malleus.

Beſides this, the *Malleus* has two other Muſcles inſerted to it: The firſt that appears in Diſſection is not ill deſcrib'd by Mr. *Du Verney*. After Chizelling off the external Surface of the *Os Petroſum*, you'll find it lying near the external Parts of the bony Channel of the *Ductus à Palato ad Aurem*, whence aſcending it enters the *Tympanum* in an oblique Sinuoſity immediately above the bony Circle, to which the *Membrana Tympani* is fixt, and is inſerted to a very long ſlender Proceſs of the *Malleus*.

Euſtachius's.

The other Muſcle of the *Malleus* was diſcovered long ago, by *Bartholomæus Euſtachius*: It lies in a bony Channel of the *Os Petroſum*, which makes one of the *Parietes Tympani*; one part of this Channel is without the *Tympanum*, and lies in the upper part of the bony Paſſage, that goes from the Ear to the Palate; the other part which is within the *Tympanum* advances as far as the *Feneſtra Ovalis*, and makes in that place a riſing, on which, as on a Pully, the Tendon of this Muſcle paſſes to the other ſide of the *Tympanum*, and is implanted on the hinder or internal part of the Handle of the *Malleus*: Before it enters the *Tympanum*, it is covered with a thick Membranous Sheath: When it Acts it pulls the Handle of the *Malleus* towards the cavity of the *Tympanum*, and makes the external Surface of the *Membrana Tympani* ſomewhat concave; by which the Sounds receiv'd are render'd more acute.

Tab. xix.

Incus.

The next Bone is the *Incus*, which has a ſmall Head, and two Legs, reſembling a hollow Grinder or Tooth. The *Baſis* or broad Part of this Bone is hollow'd, to receive the head of the *Malleus*: In the middle of which hollow is a ſmall Cavity, wherein is receiv'd the head of the *Malleus* afore-mention'd. It is faſtned by the longer

Proceſs, or Leg, to the head of the third Bone call'd

Stapes. *Stapes*, or the Stirrop, from the reſemblance to a Stirrop. This Bone is ſituated in a ſmall Cavity of the *Meatus*, call'd the *Feneſtra Ovalis*, which it cloſes exactly.

If you examine this Bone with a Microſcope, its ſides will be found to be hollow'd groves, and not ſimple ſtraight Stems, as a Stirrop. Its great Aperture is clos'd with two Membranes, that is, on each ſide one, ſo that this whole Bone makes a ſmall flat Drum. 'Tis with great difficulty theſe Membranes are preſerv'd in Human Bodies, in whom they have been ſeen, and are partly preſerv'd by the firſt Obſerver Mr. *Cowper*; but in the *Stapes* of a Calf it is ſingle and leſs liable to break in taking out the Bone, and is intirely preſerv'd by him. Tab. xix. Fig. iii. d, e.

The *Baſis* of the *Stapes* is not pervious, tho' its Centre indeed appears lucid when oppos'd to the Light; it is connected to the *Foramen Ovale* by Membranes, in ſuch manner as admits its riſing from thence, but is not removed far without lacerating thoſe Membranes.

The *Baſis* is ſometimes found a little convex towards the *Veſtibulum* of the Labyrinth and Concave towards its Head, but in other Subjects it is plain.

Muſculus Stapedis. Fig. iii. f. The *Stapes* has a peculiar Muſcle, call'd *Muſculus Stapedis*, the fleſhy Belly of which, is contain'd in a Channel in the *Os Petroſum*, laterally placed to the Branch of the hard part of the Auditory Nerve by the Fallopian Aqueduct, whence its Tendon marches out into the Cavity of the *Tympanum*, and deſcends (with reſpect to the erect poſition of the Body) to its termination in the Head of the *Stapes*. When it acts it draws the *Stapes* laterally, and upwards towards the *Feneſtra Ovalis*.

The next is the *Os Orbiculare* which is a round thin Bone; Concave on one ſide, and Convex on the other. On the Concave ſide it receives the Head of the *Stapes*, and the Convex is receiv'd by the Proceſs of the *Incus*.

Os Orbiculare. Tab. xix.

It has been a general Tradition among Anatomiſts, that theſe Bones have no *Perioſteum*; but it's certain they are not only furniſh'd with Blood-Veſſels, but have a very thin tranſparent Membrane all over them, which is continued on both ſides of the *Stapes* as above noted.

Before we proceed to that part of the Organ of Hearing call'd the Labyrinth, we muſt conſider the Cavity of the *Tympanum*. This is much leſs in Human Bodies than in moſt Quadrupeds; its Figure too varies very much from them. It is a hard matter to reconcile the Symmetry of it to any known Cavity: It appears irregular, ſomewhat arch'd over the *Membrana Tympani*, but it opens into the Sinuoſity of the Mammiform Proceſs ſo irregularly, as nothing but the thing it ſelf, or a Figure of it, can tranſmit any tolerable Idea of it, *Vid. Tab. xx.* in the *Appen. Fig.* xvi.

Cavitas Tympani.

Beſides the *Cavernulæ* of the Mammiform Proceſſes, there are divers others that alſo communicate with the *Tympanum*: Theſe may be ſeen in breaking up the *Os Temporale* to open the *Tympanum* where the *Incus* is lodged: Theſe make, as it were, the *Diploe* of the *Os Temporale* in that part, and are irregular Sinuoſities. *Valſalva* tells us, by an Injection from the Euſtachian Tube, as he calls that between the *Tympanum* and *Fauces*, he has ſeen the Liquor come into the Cavity of the Skull, and this way he fancies that *Ichor*, Blood, or ſuch like Fluids paſs from the Cavities of the Skull into the *Tympanum*.

Other Cavities beſides thoſe of the Mammiform Proceſs.

Meatus ad Palatum. Tab. xix.

From the Cavity of the *Tympanum* opens likewiſe another Paſſage, which terminates in the *Fauces* near the *Uvula*, and admits part of the

Air, which we breath into it. By this paſſage it is that Perſons who are thick of Hearing are ſuppos'd to aſſiſt that Senſe by opening their Mouths, which they are generally obſerv'd to do when they are attentive to any Diſcourſe.

In the Action of Deglutition, as the *Muſculi Pterygoſtaphilini* draw the *Uvula* upwards and forwards, they alſo compreſs the ſides of theſe Tubes, and thereby hinder any part of the maſticated Aliment, eſpecially Liquids, from paſſing into their Orifices in the *Fauces*. It is the agitation of the ſides of theſe Tubes we hear when we do the Action of Deglutition, tho' we have nothing to ſwallow.

Cochlea. Tab. xix.

In the inner part of the Cavity of the *Tympanum* is a little bony Globe, which being broken, diſcovers that Cavity which is call'd the *Cochlea*, from its ſpiral windings and tortuoſity.

Internal Membranes of the Tympanum.

The Cavity of the *Tympanum* is lin'd with a curious fine tranſparent Membrane, adorn'd with Blood-Veſſels: All the Sinuoſities that communicate with the *Tympanum* are inveſted with this Membrane; it hangs very looſe about the Tendon of the *Muſculus Internus* of *Euſtachius*, and is very evident on chizelling off the *Os Petroſum* to view the *Tympanum* in a freſh ſubject; it is continued on the ſurfaces of the *Incus*, *Malleus*, *Os Orbiculare* and *Stapes*; as will appear, if with a magnifying Glaſs you examine the parts in a freſh Subject; and is alſo continued with the *Baſis* of the *Stapes* to the ſurface of the *Foramen Ovale*, and not only hinders the *Stapes* from deſerting that *Foramen*, but excludes the Air of the *Tympanum* from the Labyrinth, which comes next to be deſcrib'd.

The Labyrinth or inner Cavity of the Ear. Feneſtra Ovalis, Rotunda.

Beſides the openings above-mentioned into the *Tympanum*, there are two others very remarkable. The firſt of which is clos'd by the *Baſis* of the *Stapes*, and from its Figure is call'd *Feneſtra*

Ovalis; the other *Rotunda*; this latter is clos'd with a tranſverſe tranſparent Membrane, plac'd a little within the ſurface of its aperture towards the *Tympanum*. Theſe *Feneſtræ*, with the whole Labyrinth (which we are now going to deſcribe) are comprehended in that part of the *Os Temporum*, properly from its hardneſs call'd *Petroſum*. The Labyrinth according to *Valſalva* may be divided into three parts, *i. e.* The *Veſtibulum*, the three Semicircular Channels, and the *Cochlea*.

Tab. xix.

Veſtibulum.

The *Veſtibulum* is a ſmall Cavity of an irregular Form, it is plac'd immediately above the *Baſis* of the *Stapes*, between the Semicircular Channels, and the *Cochlea*. In this Cavity appear ſeveral *Foramina*, as that of the *Feneſtra Ovalis*, the five *Foramina* of the Semicircular Canals, that of the *Cochlea*, beſides five others very ſmall, thro' which ſo many Nerves paſs.

Foramina.

Canalis Semicircularis Major. Fig. i, ii.

The Semicircular Canals, ſo call'd from their Figure, make up the ſecond part of the Labyrinth, which *Valſalva* divides into *Semicircularis Major*, *Minor* & *Minimus*. The *Canalis Semicircularis Major* communicates with the *Veſtibulum* by two *Foramina*, the one proper, the other common; the proper lies between the *Foramen* of the *Cochlea* and one of the *Foramina* of the leaſt Canal; the common is made by the meeting of the *Major* and *Minor* Semicircular Canals.

Minor. Tab. xix.

The *Semicircularis Minor* (by ſome call'd the Superior) is the ſecond Canal; that part of it next to the Face is plac'd above the *Veſtibulum*, with which it has a double communication, one by the *Commune*, the other by the *Foramen Proprium*; the *Foramen Commune*, in this, anſwers exactly to that in the *Major*, but the *Proprium* opens directly above one of the Orifices of the leaſt Canal laterally to the *Feneſtra Ovalis*, but directly oppoſite to the *Foramen* of the *Cochlea*.

Minimus Fig. i, iii. The *Canalis Minimus* is plac'd between the two former, and is ſhorter than either of them. It communicates with the *Veſtibulum* by two *Foramina*, one narrow, the other wider; the leſſer *Foramen* lies between the *Foramen proprium & commune* of the largeſt Canal, and looks towards the *Cochleæ Orificium & Feneſtra Ovalis*; the larger lies under the proper *Foramen* of the *Canalis Minor*, and looks towards the *Feneſtra Ovalis* and *Orificium Cochleæ*; this only of the Semicircular Canals has two proper *Foramina*.

Cochlea. Ib. 5. The *Cochlea* makes up the third part of the Labyrinth. It lies directly oppoſite to the Semicircular Canals, and is properly ſo call'd from the reſemblance it has to the Shell that Snails lie in; through its *Parietes* a ſmall Branch of the Auditory Nerve paſſes. Its Canal is divided by a *Septum*.

Septum. This *Septum* is compos'd of two Subſtances, one almoſt Cartilaginous, the other Membranous. The two Canals that are divided by the *Septum*, are called *Scalæ*; whereof the one, that looks towards the *Tympanum*, by the *Feneſtra Rotunda*, is called the *Scala Tympani*, the other has a communication with the *Veſtibulum*, juſt by the *Feneſtra Ovalis*, and is called the *Scala Veſtibuli*; the firſt lies uppermoſt, and is the largeſt; the laſt lowermoſt, and is the leaſt. Scalæ Tympani Veſtibuli.

Canalis Oſſeus. The next part, of which *Valſalva* treats, is the *Canalis Oſſeus* of the Auditory Nerves; which he divides into Common and Particular, becauſe the firſt contains both Portions of the Auditory Nerves, the latter only the *Portio Mollis*; the *Communis* is the larger, but the *Particularis* is the longer; the *Communis* deſcends obliquely towards the *Veſtibulum*, and at its end is divided into three ſmall turnings, of which one goes towards the *Cochlea*, the other two towards the *Veſtibulum*; in one of theſe laſt there is a notable *Fora-*

men, which makes the beginning of the *Canalis Particularis*, call'd *Aquæductus Fallopii*; this is divided into two parts, the ſhorteſt of which opens into the Cavity of the Skull, but the other growing larger, is inſerted between the *Proceſſus Mamillaris* and *Styliformis*. Through theſe Canals the two Portions of the Auditory Nerves paſs.

Aquæductus Fallopii.

The *Portio Dura*, after it has come to the *Foramen*, where the *Canalis Particularis* begins, runs two ways; one goes into the Cavity of the Skull and *Dura Mater*, the other, after it has ſent ſome Branches to the *Tympanum*, goes to the *Foramen*, that opens between the *Proceſſus Mamillaris* and *Styliformis*.

Nervi Auditorii Pars Dura.

The *Portio Mollis*, at the Extremity of the *Canalis Communis*, is divided into two parts, one part of it goes to the Centre of the *Cochlea*, the other through the fifth *Foramen* of the *Veſtibulum*, which, as ſoon as it enters, makes the *Membrana Veſtibuli*.

From this *Membrana Veſtibuli*, ſome other Membranes proceed, which go clear through the ſemicircular Canals, by *Valſalva* (from their Figure) call'd *Zonæ*, which he makes the *Senſorium* of Hearing.

TAB. XIX.

FIG. I. From *Valſalva*.

** THE *Helix* and *Anthelix* of the Ear, looking towards the *Concha*.

A, A Nerve that deſcends from between the firſt and ſecond *Vetebra* of the Neck.

B, A Branch of the ſame Nerve, reflecting upwards towards the Ear.

C, A Branch that goes to the lower Mandible.

D, A Branch that goes to the Muſcles of the Neck cut off at its Origin.

E, Several Branches that ſpring from *C*, one of which goes to the Parotid Gland.

F, Branches that proceed from B; a Branch of which likewiſe goes to the ſame Parotid.

G, Another Branch of B, which runs on the hinder-part of the Ear.

H, The Place where the Branch G is cauterized to remove the Tooth-ach.

I, A Branch from B, that runs behind the Ear to the upper part of the Head.

K, The *Portio Dura* of the auditory Nerve, paſſing out from *Fallopius*'s Aqueduct.

L, A Branch of the ſame Portion divided into more.

MMM, Thoſe that go to the Face.

N, Another Branch of that *Portio Dura*, that ſends Branches to the lower Mandible.

ooo, A ſmall Branch ſpringing from the ſame Portion, which, in its tendency towards the upper parts of the Head, look towards the *Meatus Auditorius*, and *Auricula*, on whoſe fore part (tho' here not ſo clearly delineated) it takes its progreſs.

P, The Trunk of the external Jugular, by which the Blood returns from the Ear.

Q, The external Branch of the Carotid Artery, which ſends the Branches, cut off at its Orgin, to the Parotids, r; the Branches (cut off likewiſe at the ſame Place) to the back-part of the Ear, s. Beſides theſe it ſends two Branches, t t, to the fore-part of the Ear, and in its Progreſs ſends a notable Branch u, towards the upper parts of the Head.

R, The Glandules of the *Meatus Auditorius*, with its reticular Body.

S, The Continuation of the *Meatus Auditorius*, within the *Proceſſus Mamillaris*.

a, The Fallopian Aqueduct.

b, The beginning of the Euſtachian Tube.

c, The cartilaginous back-part of the ſame Tube.

d, The End of the Tube.

e, The beginning of the *Muſculus Pterygoſtaphilinus*.

f, *Euſtachius*'s Muſcle of the *Malleus*.

1, The largeſt ſemicircular Canal.

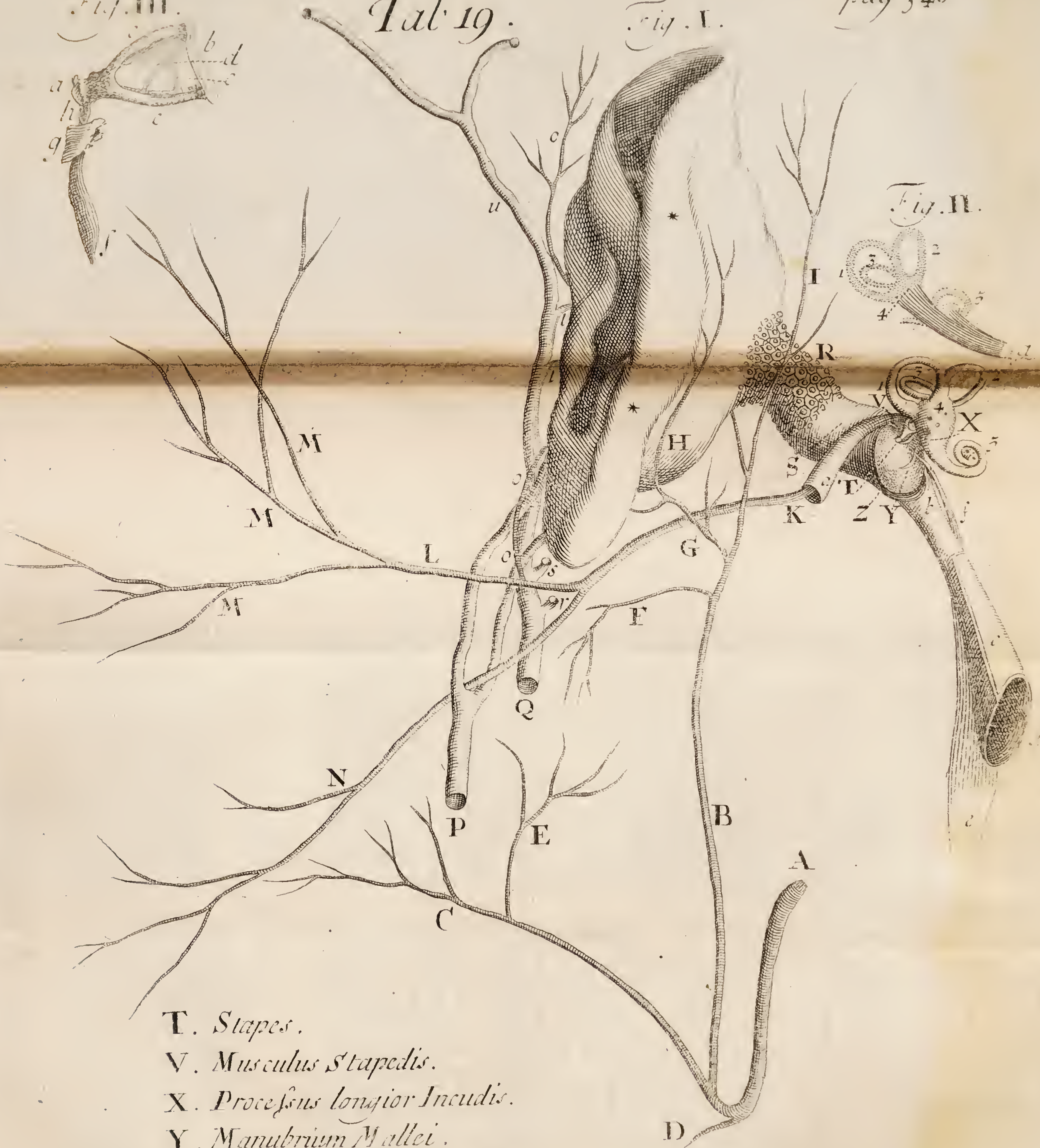
2, The leſſer ſemicircular Canal.

3, The leaſt ſemicircular Canal.

4, The *Veſtibulum*. In this Poſition of it, only three of the five *Foramina* (by which the Nerves paſs) at firſt Sight appear; a little below theſe lies a greater *Foramen*, call'd the *Feneſtra Rotunda*.

5, The Canal of the *Cochlea*, within whoſe Circumvolutions appear the little *Foramina* of the Cavity; by which *Foramina* a part of the *Portio Mollis* enters the *Cochlea*; theſe *Foramina* appear here larger than the Life.

Tab. 19.



T. *Stapes.*
V. *Musculus Stapedis.*
X. *Proceſsus longior Incudis.*
Y. *Manubrium Mallei.*
Z. *Membrana Tympani a Malleo introrsum elevata.*

FIG.

FIG. II. From the ſame Author.

SHews the Membrane that inveſts the Barrel, *Cochlea*, and the Zones of the ſemicircular Canals, with a Portion of the ſoft part of the auditory Nerves of their natural ſize, and in the ſame view as the parts that contained them are repreſented in the preceding Figures, 1, 2, 3, 4, 5.

a, The Body of the ſoft auditory Nerve.

FIG. III.

THE *Stapes* magnified with part of its double Membrane, that is extended in its hollow, not unlike the Parchment Rackets now in uſe to ſtrike Shuttlecocks.

a, The Head of the *Stapes*, in which is a ſhallow Cavity that receives the *Os Orbiculare*, by the mediation of which Bone the *Stapes* is articulated with the long Proceſs of the *Incus*.

b, The *Baſis Stapedis*.

cc, Its hollowed ſides, to the Margins of which its double Membranes are fixed, d, e.

d, Part of the Membrane of the external Surface,

e, A Portion of the Membrane of the internal Surface.

f, The fleſhy Belly of the *Muſculus Stapedis*.

g, Part of the *Os Petroſum*, broke off in freeing the Muſcle from its bony Canal.

h, The Tendon of the *Muſculus Stapedis*, paſſing through the part of the *Os Petroſum*, expreſs'd at g. to its Termination in the upper part of the Head of the *Stapes*.

CHAP. XIII.

Of the EXTERNAL PARTS *of the* FACE.

External Parts of the Face enumerated.

BEfore we proceed to the Inſtrument of Taſt, it may not be improper to take a view of the EXTERNAL PARTS of the FACE, the Principal of which (not yet deſcribed) are the Forehead, Temples, Cheeks, Lips, Chin, and *Buccula* or double Chin. Theſe all conſiſt, and are made up of the common or univerſal Integuments of the whole Body, *viz.* the Cuticle, Skin, *Membrana Carnoſa* and Fat, which, with the Muſcles and Glands proper to thoſe Parts, conſtitute the whole Subſtance of them.

Muſcles of the Fore-head. The Forehead has two Muſcles, on each ſide one, which are ſaid to ſpring from the Skull, near the Coronal Suture; but their Original has been obſerv'd both by *Fallopius* and *Columbus*, from the Occipital Muſcles; or rather that the *Frontales* and *Occipitalis* are one continued Digaſtrick Muſcle on each ſide, moving the Scalp and Skin of the Fore-head and Eye-brows. That part call'd the *Occipitalis* ſprings fleſhy from part of the *Os Temporale* and *Os Occipitalis*, above the Termination of the *Muſculus Maſtoideus* and *Cucullaris*; and after a ſmall aſcent becomes a thin Tendon, which marches over the whole ſuperior Surface of the *Bregma* and temporal Muſcle; where it parts with ſome fleſhy Fibres to the Auricles, and makes the *Attollens Auriculam*; its other part, that covers the temporal Muſcle, is thick and tendinous, and is faſtned to the *Os Jugale*; and this is what former Anatomiſts call'd the *Pericranium*, running over the temporal Muſcle. The ſuperior part of this Tendon is exceeding thin, but becomes fleſhy after it has paſs'd the Coronal Suture, where it has the Name of *Muſculus Frontalis*, with Fibres paſſing obliquely to the Eye-brows, in which it terminates, and in the lower part of the Skin of the Fore-head. It has two Appendages, the Superior or External reaches to the Cartilages, but is moſt commonly fix'd to the Bone of the Noſe: Its inferior Appendage lying under the former, is fix'd to the *Os Frontis* at the Margin of the Orbit next the Noſe, and is by *Volcherus Coiter* made a diſtinct Muſcle; by ſome call'd *Corrugator*, from its uſe in drawing the Eye-brows to each other, which we call frowning, or knitting the Brows.

TheCheeks conſiſting only of the common Integuments already mention'd,and Muſcles contributing to the Motion of the lower Jaw, we ſhall refer the Deſcription of them to the Chapter,wherein we ſhall treat of the Bones they help to move. *TheCheeks.*

The Lips, beſides the common Integuments, conſiſt of two Parts; the Exterior hard and muſculous; the Interior, ſoft, ſpongy, and glandulous, cover'd with a fine Membrane; the fore and protuberant Parts of which are red, and call d by Authors *Prolabia.* Authors have generally contented themſelves to call the Subſtance of this part a ſpongy ſort of Fleſh; but in reality it is glandulous, as it manifeſtly ſhews itſelf to be by the ſcrophulous and cancrous Tumours to which it is very ſubject, and which are proper only to glandulous Parts. *The Lips.* Prolabia.

The Muſcles, of which the outward Parts of the Lips conſiſt, are either common to them with other Parts, or proper. The Common are the third Pair of the Noſe already deſcrib'd, the *Subcutaneus*, to which ſome add the *Buccinacor.* *Muſcles.*

The *Subcutaneus*, call'd alſo *Quadratus*, ariſes with a pretty broad Origine from the hinder part of the Neck, and from the Pectoral Muſcle below the Clavicle; and is a thin membranous Muſcle, running immediately under the Skin. It adheres firmly to the *Panniculus Carnoſus*, from which it is difficultly ſeparated, and therefore was not anciently diſtinguiſh'd from it, and is inſerted obliquely on each ſide into the lower Jaw-bone near the Chin, Lips, and ſometimes the bottom of the Noſe, all which parts it draws downwards, and a-wry. A Convulſion in either of theſe Muſcles draws the Mouth a-wry on that ſide downwards, and is called *Spaſmus Cynicus.* It reaches ſometimes to the Ears, which is the reaſon that Subcutaneus. Spaſmus Cynicus.

that ſome Men have the Faculty of moving them, which others have not, that want this Communication.

Ignorant Surgeons have ſometimes, in making tranſverſe Sections upon the Neck, divided this Muſcle, which lies cloſe to the Skin, and ſo have occaſion'd the Mouth ever after to be drawn towards the other ſide.

Buccinator. The *Buccinator* ſerves to draw the Lips lengthways, and ſo to widen the Mouth. It ariſes from the internal part of the *Proceſſus Coronæ* of the lower Jaw, (where it joins with the *Muſculus Pterygopharingæus*,) and from the upper Jaw-bones near the Gums, whence its fleſhy Fibres paſs directly to the Termination of the Angle of the Lips. The *Ductus Salivalis ſuperior*, from the Parotid Gland, paſſes through the middle of this Muſcle into the Mouth.

Muſcles of the Lips. There are ſix Pair of Muſcles belonging to the Lips, and one ſingle one. Of theſe, three are peculiar to the upper and under Lip; the other three, and the ſingle Muſcle, are common to both Lips.

Attollens Labium Superius. The peculiar are the *Attollens Labium ſuperius*, *Deprimens Labium inferius*, *Attollens Labium inferius*.

Attollens Labium ſuperius, ſpring fleſhy from the fourth Bone of the upper Jaw, and expands it ſelf at its Termination on the upper Lip; where it joins with its Partner from the *Septum Narium* to the *Sphincter Labiorum*. The *Deprimens Labium inferius* is plac'd between the *Depreſſores Labiorum Communes*, on that part call'd the Chin. It appears to be but one Muſcle, aſcending with a two-fold Order of fleſhy Fibres, terminating in the lower Lip. The *Attollens Labium inferius* ariſes fleſhy from the fore-part of the lower Jaw, immediately under the Gums of the *Dentes inciſores*, and deſcend to their Inſerti-

Deprimens Labium inferius.

Attollens Labium inferius.

ons to the Skin of the lower part of the Chin.

Zygomaticum.

The other three Pair, which are in common, are firſt the *Zygomaticum*, which has its Origine from the *Proceſſus Jugalis*, and is inſerted at the corner of the Mouth, where the Lips are join'd. This is a pretty fleſhy ſmooth Muſcle, and draws both Lips laterally upwards.

Depreſſor Labiorum.

The ſecond Pair, which is by ſome call'd *Depreſſor Labii ſuperioris*, is however common to both Lips, and ariſing with a broad Origine from the lower Margin of the under Jaw, by the ſide of the Chin, is inſerted with a narrow Tail into each Lip, near their Coalition, and draws them obliquely downwards.

Attollens Labiorum.

The third common Pair is the *Attollens Labiorum*; 'tis plac'd between the *Zygomaticus* and *Attollens Labium ſuperius*, it ariſes from the fourth Bone of the upper Jaw, and terminates at the Angle of the Lips, under the *Zygomaticus*.

Orbicularis ſeu Conſtrictor.

The laſt is the Orbicular Muſcle, which is more ſtrictly proper to the Lips than any of the reſt. Its Fibres make a ſort of Ring about the Mouth, and ſerve to conſtringe and draw up the Lips. This *Verheyen* contends not to be one Muſcle, but a Pair, whoſe Fibres meet and join at both corners of the Mouth; each acting but upon one Lip only, tho' concurrently. Other Authors are unanimous in calling it one Muſcle, and look upon it a *Sphincter*, tho' we think improperly: Becauſe it is not like other *Sphincters* in conſtant Action, but under the Command of the Will, by which Differences all other *Sphincters* are diſtinguiſh'd from other Muſcles. But this is a Controverſy of no great Moment.

Blood-Veſſels.

All theſe Parts are ſerv'd with Blood by ſome Branches of the Carotids, which its Veins carry back to the external Jugulars.

Nerves. Their Nerves come from the fifth, ſixth, and eighth Pair of the Head, as likewiſe ſome Twigs from the *Par Acceſſorium*, which ſprings from the *Medulla Spinalis*.

CHAP. XIV.

Of the INNER PARTS *of the* MOUTH.

Glandulous Coat. THE Inner Parts of the MOUTH are the inſide of the Cheeks and Lips, the Gums and Palate. All theſe are lin'd with a glandulous Coat, which is continu'd over the whole inner Surface of the Mouth, and all its Parts, the Teeth excepted. From the Glands of this Coat, thro' innumerable little excretory Ducts, is ſeparated a kind of ſalival Juice, which ſerves to keep the Mouth, and all its Parts, moiſt, ſmooth, and ſlippery.

Uvula. On the hinder part of the Palate, perpendicularly over the *Rima* of the *Larynx*, hangs a round ſoft ſmooth Body, like the end of a Child's Finger, form'd from the Duplicature of the Membrane of the Palate, which is call'd the *Uvula*, and by ſome *Columella* and *Gurgulio*, and is moved by two Pair of Muſcles, and ſuſpended by as many Ligaments.

Muſcles. Spheno-ſtaphilinus. Theſe Muſcles are call'd the External and Internal: The External is call'd *Sphenoſtaphilinus*; it deſcends from a round fleſhy Origination, near the Root of a Proceſs of the *Os Sphenoides*, which lies directly between the *Ala Veſpertilionis* and *Proceſſus Styloides*, and is implanted into the poſterior part of the *Uvula*, where it joyns with its Partner. This draws the *Uvula* upwards and backwards, and hinders the maſticated Aliment from paſſing into the *Foramina Narium* in Deglutition.

The internal Muſcle of the *Uvula* is called *Pterygoſtaphilinus*, and by *Valſalva*, *Novus Tubæ Muſculus*, as if it had not been known to former Anatomiſts; becauſe, he ſays, it belongs to the *Meatus à Palato ad Aurem*, which he calls *Tuba Euſtachiana*. Its Origine is near that of the *Sphenoſtaphilinus*, from the *Os Petroſum* where the Tube from the Palate enters that Bone, near an acute Proceſs of the *Os Sphenoides*, and the entrance of the Carotid Artery: Here it is fleſhy, and its lower ſide adheres to the cartilaginous part of the Tube, and does not ſpring from the whole fore-ſide of the Tube, as *Valſalva* would have it. Hence it aſcends to the *Proceſſus Pterygoides*, where it becomes a broad flat Tendon, which expands itſelf on the fore-part of the *Uvula*; ſome of which tendinous Fibres aſcend to the lower edge of the *Os Palati*; others deſcend down the ſides of the *Fauces*, where they are loſt under the *Amygdalæ*: But the middle Series of this tendinous Expanſion, either unites with thoſe of the other ſide, or is loſt in two fleſhy Bodies that compoſe the Body of the *Uvula*. Pterygoſtaphilinus.

When this and its Partner act, as they always do together, they not only draw the *Uvula* upwards and forwards, but raiſe the *Amygdalæ* alſo; which Action we may obſerve, when we inſpect the *Fauces*. Between the *Uvula* and the Tongue, *Valſalva* tells us of a Muſcle, which, altho' ſmall, has a diſtinct Action, and appears to move the internal glandulous Membrane of the *Fauces*, when we look into theſe Parts in living People. The ſame Author makes a diſtinct Muſcle (belonging to the *Uvula*) of a Series of Fibres, mention'd in deſcribing the Muſcles of the *Fauces*, Page 63. Gloſſoſtaphilinus.

Under the Membrane of the Palate are a great Number of pretty conſpicuous Glands, ſcatter'd in *Glands of the Palate.*

in the fore-part of it, like Grains of Millet with many Interſtices, whoſe excretory Ducts piercing the Membrane, open into the Mouth: But towards the hinder-part they lie much thicker, and about the Root of the *Uvula* are gather'd and heap'd ſo cloſe to one another, that they ſeem to form one pretty large conglomerate Gland, which is therefore call'd by *Verheyen*, *Glandula Conglomerata Palatina.*

Glandula Palatina Conglomerata.

The Gums, which are as it were the Ligaments of the Teeth, are form'd inwardly of a Production of the *Perioſteum* of the Jaws, and of the Membrane of the Mouth already deſcrib'd, which being firmly united, and wrapp'd hard about the Roots of the Teeth, hold them faſt in their Sockets, as appears by their dropping eaſily out, when the Gums, by any Accident or Diſtemper, are eaten away or relaxed, and render'd looſe and ſpongy.

Gingivæ.

Theſe, with the Bones elſewhere to be ſpoken of, are the Parts that compoſe the Mouth: Beſides which, there are in and about the Mouth others, though not proper conſtituent Parts of it, yet are highly ſerviceable and neceſſary, and therefore properly to be conſider'd in this Place.

Glands.

Parotides.

Of this Number are the Glands, of which the moſt conſiderable are the *Parotides*, which have been already deſcrib'd. Theſe, tho' ſituated behind and below the Ears, yet have their excretory Ducts, which run through the *Buccinatores* to the upper Jaw, and there diſcharge themſelves into the Mouth.

Glandulæ Maxillares. Tab. ii. Fig. ii. K K.

The *Glandula Maxillaris* is a conſiderable Gland, and of the conglomerate ſort. It is ſituate on the inſide, under the lower Jaw-bone, near the *Muſculus Digaſtricus.* It diſcharges it ſelf by ſeveral Branches of Ducts, which form one Trunk that paſſes under the *Muſculus Mylohyoïdeus*, and meets with that of the other ſide, within the Fore-Teeth of the lower Jaw, having diſtinct Orifices with a *Papilla* on each ſide the *Frænum Linguæ.*

Sublinguales. App. Tab. xxiv. Fig. viii.

The *Sublinguales* are yet leſs conſiderable than theſe, but of the conglomerate kind likewiſe, and lie underneath the Tongue on each ſide. Their excretory Ducts are but ſmall, and running parallel with the *Maxillares*, approach each other, and open at ſeveral Apertures in the ſame *Papillæ*, which are ſcarce diſcoverable unleſs the Glands are preſs'd.

Amygdalæ.

The *Tonſillæ*, vulgarly call'd the Almonds of the Ear, are ſituated at the Entrance of the *Fauces*, on each ſide of the *Uvula*, a little below it. They are pretty large conglomerate Glands, having each of them a conſiderable *Sinus*, which receives a mucous Matter from divers leſſer ones, and diſcharges it into the *Fauces*, to moiſten and lubricate them, and perhaps to facilitate Deglutition; becauſe, whenever the Muſcles of the *Oeſophagus* act, they compreſs theſe Glands, and force out a part of their Contents.

From theſe ſalival Organs ſprings all that Liquor we call the Spittle, which flows into the Mouth by the reſpective Ducts, after its Separation from the Blood in the Bodies of the Glands. As the demand of Spittle is greater in Actions of the lower Jaw, *i, e.* in Maſtication, Deglutition, much talking, *&c.* ſo the Diſpoſition of theſe ſalival Ducts, to favour the Diſcharge on thoſe Occaſions, is very remarkable. Thus the Ducts of the parotid Glands paſs cloſe over the *Muſculi Maſſeteres*, and thro' the *Buccinatores:* The ſalival Ducts of the *Glandulæ Maxillares* paſs cloſe under the *Muſculus Mylohyoideus*, where the ſublingual Glands are placed; by this means the Intumeſcence of the *Muſculi Maſſeteres*, in chawing, accelerate the Spittle in the parotid ſalival Ducts; as the *Muſculus Mylohyoideus* does in the

Action of Deglutition, in drawing the *Os Hyoides* upwards. The agitation of the Cheeks and Lips is ſufficient to promote the diſcharge from the *Glandulæ Labiales*, and *Buccarum*, mention'd in the beginning of this Chapter, by the Name of the glandulous Coat.

Foramina Narium. Behind the *Uvula* is a conſiderable large Perforation in the Palate, which, at its Orifice next the *Fauces*, is ſingle, but is immediately divided into two, which go to the reſpective Noſtrils, and is each of them capacious enough to admit a Man's little Finger. Through theſe Holes the Air is admitted and expell'd, when the Mouth is ſhut.

C H A P. XV.

Of the Os HYOIDES and TONGUE.

THE TONGUE, tho' no proper part of the Mouth, is, however, its great Comfort and Ornament, being the ſole Organ of Taſte, and the main Inſtrument of Speech and Deglutition.

Connexion. It is ty'd to the *Os Hyoides*, to the *Larynx*, and to the *Fauces*, and to the lower parts of the Mouth, by means of the *Frænum*, which is a membranous Ligament running along the lower ſide of it, in the middle about half way; though ſometimes it is extended even to the Tip, and would in ſuch Perſons, if not cut, take away all poſſibility of Speech.

Os Hyoides *or* Bicorne. Tab. xxiii. Fig. v, vi. At the Root of the Tongue is plac'd the *Os Hyoides*, and is, as it were, the *Baſis* and Foundation of it. This Bone is ſo called from its imperfect reſemblance of the *Greek Upſilon*; and is compos'd in adult Perſons generally of three little

Bones, and in Children often of five, ſeven, or more. The middle Bone of the three which is the ſhorteſt and broadeſt is call'd the *Baſis*; and the two ſide Bones the Horns, whence it is called *Bicorne* and *Ceratoides.*

Baſis. The *Baſis* is about a Thumb's breadth long, or ſomewhat more, on the outer ſide of that Bone which is Convex; and conſequently ſomewhat longer than the inner, which is Concave; it is about half a Finger broad, and thicker in the middle than elſewhere, by reaſon of a ſmall Protuberance.

Cornua. The *Cornua* or Horns, are about an Inch and an half long, and broader at the bottom, than at the Extremities; which are near two Inches aſunder.

Proceſſus or Appendices. It has two Cartilaginous Proceſſes call'd *Cornicula*, faſtned about the Juncture of its *Cornua*, with its Fore-Bone or *Baſis*: Theſe *Cornicula* are ty'd to the *Proceſſus Styloides*, by long ſlender Ligaments, which in ſome Bodies become Bony in divers parts: where you will alſo very often find an elegant ſmall Muſcle, between this *Cornicula* and *Proceſſus Styloides*, beſides the *Muſculus Styloceratohyoideus* and Ligament above-mention'd. *Muſcles in ſome Bodies.*

Situation. Its *Baſis* lies as it were upon the Head of the *Larynx*, and its Horns are faſtned by Ligaments to the upper Proceſſes of the *Cartilago Scutiformis*, and to the *Proceſſus Styloides.*

Muſcles. This Bone is mov'd by five pair of Muſcles. The firſt pair is call'd *Sternohyoideum*, and ariſes from the upper and internal part of the Bone of the *Sternum*, and part of the Clavicle, and adjoyning part of the firſt Rib, with a broad Origine, and running over the *Aſpera Arteria*, *Glandulæ Thyroideæ*, and *Cartilago Scutiformis* terminates in the *Baſis* of the *Os Hyoides*: This draws the Bone ſtrait downwards. Sternohyoideum. Tab. xxv. g.

The

Coraco-hyoides. Ib. 6.

The ſecond Pair is longer, ſlenderer and lies deeper. It ſprings Fleſhy, from the ſuperior *Coſta* of the *Scapula*, not far from the *Proceſſus Coracohyoides*, and terminates in the *Baſis* of the *Hyoides*, whence it is call'd *Coracohyoides*. This is a kind of digaſtrick Muſcle, having a Tendon in its middle, where it paſſes between the *Muſculus Maſtoideus* and the Veſſels that go to the Head. This draws the Bone backwards and downwards.

Mylohy-oideum. App. Tab. xxxix. Fig. iv. ee.

The third is the *Mylohyoideum*, which is a broad, but ſhort Muſcle lying immediately under the *Biventer* Muſcle of the Jaw, and ſprings from the lower Margin on each ſide of the under Jaw, and is inſerted into the *Baſis* of the *Hyoides*. It draws the Bone forwards.

Geniohy-oideum. *Ib.* Fig. v. f.

The fourth is call'd *Geniohyoideum*, and ariſes likewiſe from the fore-part internally of the under Jaw, and beneath the former, but with a narrower Head; and this goes to the middle of the *Os Hyoides*, and draws it forward and upwards.

Stylohy-oideum. Ib.

The fifth and laſt Pair, is call'd *Stylohyoideum*, and ſprings from the *Proceſſus Styloides*, and is inſerted into the *Baſis* and Horns of the *Os Hyoides*, and draws it laterally upwards.

Tongue App. Tab. xxiii.

The main Bulk and Body of the Tongue, is made up of Muſcles, which are cover'd on the upper Part with a Papillar Nervous ſubſtance, over which are ſpread two Membranes.

External Mem-brane.

The outer of theſe Membranes is pretty thick, and ſoft, and full of *Papillæ*, of a Pyramidal Figure, eſpecially towards the Tip; which *Papillæ* ſtand pointing towards the Root of the Tongue in a bending Poſture, which makes their Figure to be *Concavo-convex*. Theſe *Apices* or *Papillæ*, are ſo very Minute and Tender in Men, that they make the Coat appear on the upper part to be villous; eſpecially as they approach nearer to the Root. The Figure of its *Papillæ*, is not in human Tongues ſo plainly diſcernible to the naked Eye, as not to need the Aſſiſtance of a Microſcope. In Brutes they are generally larger, ſtiffer, and more conſpicuous, and in ſome almoſt Cartilaginous, as may be felt in the Tongues of Cats, Oxen, and eſpecially Lyons, *&c.* On the under ſide, a little diſtance from the Tip, this Membrane becomes thin, ſmooth, and glabrous; and as it were poliſh'd by the lower Parts of the Mouth, upon which it ſlides.

Inward Coat.

Under this lies a thin, ſoft, reticular kind of Coat punch'd through with innumerable Holes, and always lin'd with a thick white or yellowiſh *Mucus.* This Membrane is ſo exceeding tender, and ſo full of *Mucus*, that it is not examinable by the naked Eye unleſs boiled, by which it grows tough, and eaſily ſeparable from the external Membrane, and from the nervous part of the Tongue which lies immediately under it: After boiling it appears like a kind of Gawſe, between whoſe Threads innumerable Holes appear, through which the *Apices* of the Papillary Body underneath it are exerted. This Membrane on the upper ſide next the outward appears white, with a caſt towards yellow, but black on the ſide next the Tongue.

Why allowed to be a Membrane.

Many Authors do not allow this as a Membrane, and will have it only to be a *Mucus* hardned by boiling: But ſince it has ſo much of the reſemblance of a Membrane; and that Authors do agree in allowing two Membranes to the Tougue, I have not ſcrupled to number it among them, ſince it does not appear to me that there is any other ſecond Membrane, or Coat of the Tongue in general, reckoning with *Malpighius*, the ſmooth Part under the Tongue, to be part of the outer Membrane.

Corpus Papillare Nervoſum.

Immediately under this appears a Nervous Papillary Body, ſpreading itſelf to a pretty thickneſs over the whole Surface of the Tongue. This Body is on the under ſide every where level and ſmooth, except in ſome few places where it is connected to the ſubjacent Muſculous Part by ſome Nervous Twigs, which it ſends into it.

Papillæ. The *Papillæ*, which compoſe this Body, are by the moſt accurate *Malpighius* (who has been the moſt curious and ſucceſsful Obſerver of this Part) diſtinguiſh'd into three ſorts, from their different Magnitudes and Figures obſerv'd by the Microſcope; of which thoſe ſeated on the Sides and Tip are very ſingular, reſembling little round Pyramids, with Globes on their tops, like the Horns of Snails. All theſe *Papillæ*, which are the immediate Organs of Taſting, ſend their *Apices* or Extremities through the *Mucous* Membrane, into the Pyramidal *Papillæ* of the outward Membrane, which are all hollow to receive them, and ſeem to be nothing elſe but a ſort of Caſes to defend their Nervous *Papillæ* from Injuries, which the Salts and Aſperities of thoſe Bodies, which we take into our Mouths, might do them.

Muſcles. The reſt of the Body of the Tongue conſiſts of Muſcles, which makes far the greateſt Part of it. Authors are not agreed about the number of the Muſcles which compoſe it; ſome confounding thoſe of the *Os Hyoides* and the Tongue, reckon eight, nine, ten, and more Pair. Some number thoſe proper to the Tongue alone ſix Pair, others five, others but four, and ſome will allow no more than three, as real, diſtinct Muſcles.

In this perplexity of accounts, which is more confus'd than numerous, I ſhall follow that, which is the moſt ſimple, but moſt inſtructive, which is that of our ingenious Countryman Mr. *Cowper*, whoſe great Skill and Experience in Anatomy is ſufficient to warrant his account. He rejects the ſubdiviſion of thoſe who unneceſſarily multiply them to ſix Pair, and in his Book of the Muſcles allows but three genuine Pair of Muſcles to the Tongue, which are the *Par Genioglosſum*, *Ceratoglosſum*, *Styloglosſum*, nam'd from their Origines and Inſertions.

Genioglosſum.

" The *Genioglosſum* lies immediately under the " *Geniohyoideum* before deſcribed: They ariſe " fleſhy from the fore-part of the lower Jaw in- " ternally, and enlarging themſelves, are inſert- " ed into the Root of the Tongue; when theſe " act, they pull the Tongue forwards, and " thruſt it out of the Mouth.

Ceratoglosſum.

" The next is call'd *Ceratoglosſum*, which has " a broad fleſhy Origination, at the ſuperior part " of the *Os Hyoides* laterally, whence it aſcends " to its Inſertion at the Root of the Tongue. " This with its Partner acting, draw the Tongue " into the Mouth directly; if one of them act " only, it moves it on one ſide.

Styloglosſum.

" The third is *Styloglosſum*, this runs off ſharp " and fleſhy, from the *Proceſſus Styloides*; whence " deſcending obliquely forwards, it is inſerted " into the Root of the Tongue, immediately be- " low the implantation of the former. This " pulls the Tongue up in the Action of Degluti- " tion, as was before noted.

Mr. *Cowper* mentions the conſent of moſt Authors, except *Fallopius*, in the exiſtence of the *Baſioglosſum*, and his Thoughts thereupon; in farther ſatisfaction of which, he does, upon inquiry, find ſome Fibres, which by their contrary Order to thoſe of the *Genioglosſum*, encourages him to allow the *Baſioglosſum*, which, together with the foremention'd, makes the Body of the Tongue, and may ſerve to draw it towards its *Baſis*.

Chondroglosſum.

Beſides theſe, *Verheyen* mentions two other Pair, one very ſmall one, which he calls *Chondroglosſum*, a very ſhort and narrow pair, which ariſe from the Cartilaginous Proceſſes of the *Os Hyoides*, and meeting in the middle of the *Baſis* of the Tongue are inſerted there, forming a kind of Arch under it. This pair has been maintain'd by ſo many Authors, that 'tis probable it may be found in ſome ſubjects, but not conſtantly nor generally. This liberty of adding, and omitting parts leſs principal, is frequently taken by Nature, in ſome of more moment than this pair of Muſcles.

Mylogloſſum. The ſixth pair, mention'd by *Spigelius* under the Name of *Mylogloſſum*, and which *Verheyen* doubtingly fancies himſelf to have ſeen, is ſo obſcurely deſcrib'd, and ſtands upon ſuch ſlender Authority, that it is not worth farther mention.

Linea Mediana. Down the middle of the Tongue, lengthwiſe, runs a Seam, which divides it to the bottom into two equal parts, but not ſo effectually but that the Blood-Veſſels of one ſide communicate with thoſe of the other.

Veſſels. Theſe Veſſels are Arteries from the *Carotides*, and Veins call'd *Ranulæ*, and are very conſpicuous about the *Frænum* under the Tongue, which re-convey the Blood to the external Jugulars. Theſe Veins are frequently open'd in the *Angina*, and is the *Anchora Sacra* of Old Women and the Vulgar in thoſe Caſes. The Nerves of the Tongue come from the fifth, and ſixth, and ninth pairs. The two firſt of which have been call'd *Guſtatorii*, and the latter *Motorii Linguæ*.

Before we come to the *Artus*, it may not be improper to lay down a Plan of the general diſtribution of the Blood-Veſſels; this ſeems to be beſt done by Figures, though ſome Anatomiſts have taken a great deal of Pains to very little Satisfaction without. It muſt be confeſt, Nature is not regular even in the largeſt Trunks of the

Arteries and Veins, which has given occaſion to ſome Anatomiſts of cenſuring others as incorrect, when in truth it has ariſen from the diverſity in ſubjects, as is well known to experienc'd Anatomiſts. The annex'd Figure of the Arteries you may depend upon as done from the Life. The Trunks of the Veins being leſs certain than the Arteries, we don't at preſent think it neceſſary to add any other Figure of them than what you find in the *Appendix*, *Tab.* iii. The inquiſitive may find a Figure of the Veins lately done from the Life, in the Philoſophical Tranſactions, No. 280. in the Year, 1702.

T A B. XX.

1. THE *Aorta* or *Arteria Magna* cut from its Origin at the Orifice of the left Ventricle of the Heart.

A, The three ſemilunary Valves of the *Aorta*, as they appear when they hinder the Blood coming back into the Left Ventricle, when the Heart is in *Diaſtole*.

2. The Trunk of the great Coronal Artery of the Heart, ariſing from the beginning of the *Aorta*; the riſe of the leſſer Coronal Artery not appearing in this poſition of the *Arteria Magna*.

3. *Ligamentum Arterioſum*.

4,4. The Subclavian Arteries ariſing from the *Arteria Magna*, to which the Axillary Arteries, and thoſe of the Arms (23, 23,) are continued.

5, 5, The two *Carotid* Arteries, the right ariſing from the Subclavian, the left from the *Aorta*.

6, 6, The two Vertebral Arteries ariſing from the *Subclavicula*, which paſs thro' all the Tranſverſe Proceſſes of the *Vertebræ* of the Neck, from whence they are here freed.

7, 7. The Arteries which convey Blood to the lower part of the Face, Tongue, adjacent Muſcles, and Glands.

8, 8. The Trunks of the Temporal Arteries ſpringing from the *Carotids*, and giving Branches to the *Parotid* Glands, and to

9, 9. The Neighbouring Muſcles, hairy Scalp, and Forehead.

10,10. Trunks which ſend Blood to the *Foramina Narium*, particularly the Glands of its *Mucous Membrane*.

11,11. The Occipital Arteries, whoſe Trunks paſs cloſe by the *Mammiform* Proceſs, and are diſtributed on the hinder part of the hairy Scalp, where they are inoſculated with the Branches of the Temporal Arteries.

12. Arteries, which carry Blood to the *Fauces*, *Gargareon*, and Muſcles of thoſe Parts.

BB, A ſmall portion of the *Baſis* of the Skull, that is perforated by the Artery of the *Dura Mater*, here expreſt with part of the *Dura Mater* remaining to it.

13, 13. The contorſions of the *Carotid* Arteries, before they paſs the *Baſis* of the Skull to the Brain.

14, 14. Thoſe parts of the *Carotid* Arteries, where they paſs by each ſide of the *Sella Turcica*, where divers ſmall Branches do ariſe from them, and help to compoſe that *Rete Mirabile*, which is more conſpicuous in Quadrupeds, than Men.

C, The *Glandula Pituitaria*, taken out of the *Sella Turcica*, lying between the two contorted Trunks of the *Carotid* Arteries, 14, 14.

DD, The *Arteria Opthalmicæ*, which ſpring from the *Carotids* before they enter the *Pia Mater*.

15. The contorſions of the Vertebral Arteries as they paſs the Tranſverſe Proceſſes of the firſt *Vertebræ* of the Neck, towards the great *Foramen* of the *Os Occipitis*. We have more than once taken notice, that the Cavities of theſe Arteries, where they are contorted, have been larger than their inferior Trunks, whereby the *Impetus* of the Blood muſt neceſſarily be very much leſſened, as well as by their contorſions only. In Quadrupeds the Angles of three contorſions of the Arteries of the Brain are more acute, which in them is the more neceſſary to leſſen the force of the Blood at their extremities, by reaſon of the Horizontal poſition of their Trunks.

16. The two Trunks of the Vertebral Arteries, that lie on the *Medulla Oblongata*.

17. The communicant Branches between the *Carotid* and *Cervical* Artery.

18, 18. The ramifications of the Arteries within the Skull; the larger Trunks of which lie between the Lobes of the Brain, and in its *Sulci*. From the extremities of theſe Arteries of the Brain, are continued its Veins, whoſe Trunks vary much in their continued Poſition from the Arteries: They ent'ring the Brain at its *Baſis*, and diſtributing themſelves, as above noted; whereas the Trunks of the Veins are extended on the ſurface of the Brain, and diſcharge their Blood into the Longitudinal *Sinus*. Nor do the Veins of the Brain accompany their Arteries at their Ingreſs, as in other Parts: As the Arteries and Veins of the *Dura Mater* do, both which paſs thro' the ſame *Foramen* in the *Baſis* of the Skull, B B.

E E, The Arteries of the *Cerebellum*.

19, 19. The Arteries of the *Larynx*, *Thyroid* Glandules, and adjacent Muſcles and Parts, ariſing from the Subclavian Arteries.

20,20. Others ariſing near the former, which convey Blood to the Muſcles of the Neck and *Scapula*.

21, 21. The *Mammariæ*, which ariſe alſo from the Subclavian Arteries, and deſcend on the Cartilages of the true ribs internally, about half an Inch diſtant on each ſide the *Os Pectoris* or *Sternum*. Some Branches of theſe paſs thro' the Pectoral as well as Intercoſtal Muſcles, and give Blood to the *Mammæ*, where they meet with ſome Branches of the Intercoſtal Arteries, to which they are inoſculated.

Theſe Mammary Arteries join with the large Trunks of the *Epigaſtricks* (57, 57.) alſo, by which means the *Impetus* of the Blood of the Integuments of the *Abdomen* is carry'd on with more force; the Extremities of the Intercoſtal and Lumbal Arteries alſo inoſculate with each other, as well as theſe.

22, 22. The Arteries of the Muſcles of the *Os Humeri*, and ſome of thoſe of the *Scapula*.

23, 23. Thoſe Parts of the large Trunks of the Arteries of the Arm, which are liable to be wounded in opening the *Vena Baſilica*, or innermoſt of the three Veins in the bending of the Cubit.

24, 24. The diviſions of the Arteries of the Arm below the Flexure of the Cubit.

25, 25. A communicant Branch of an Artery ariſing from the Trunk of the Artery of the Arm above its flexure at the Cubit, which is inoſculated with the Arteries of the Cubit below. In ſome Subjects you will not find this communicant Branch, as here repreſented; in whom there are divers ſmaller Branches of the ſame kind. By theſe communicant Branches (of the upper part of the Brachial Artery with thoſe of the Cubit) the Blood ſtill paſſes, tho' the Trunk (23.) is firmly ty'd, which is done in taking up the Artery, as it is call'd, when 'tis wounded in the caſe of an *Aneuriſma*: Beſides firmly tying the Trunk of the Artery above the Place where it is wounded, it is alſo neceſſary to tye it in like manner below, leſt the Blood, convey'd by the communicant Branches to the inferior Trunk, ſtill pours out at the wound of the Artery from below, in a retrograde manner.

26. The external Artery of the Cubit, which makes the Pulſe near the *Carpus*.

27, 27. The Arteries of the Hands and Fingers.

28, 28. The deſcending Trunk of the *Arteria Magna*.

29. The *Arteria Bronchialis* ſpringing from one

of the Intercoſtal Arteries; it ſometimes ariſes immediately from the deſcending Trunk of the *Aorta*, at other times from the Superior Intercoſtal Artery, which ſprings from the Subclavian. Theſe Bronchial Arteries inoſculate with the Pulmonary Arteries, *Vid. Ruyſch. Epiſt. Anatom.* 6. *Fig.* c, c, c.

30. A ſmall Artery ſpringing from the forepart of the *Aorta Deſcendens*, paſſing to the *Gula*. *Ruyſch* tells us of Branches of Arteries from the Superior Intercoſtal, which go to the *Gula*.

31, 31. The Intercoſtal Arteries on each ſide the *Arteria Magna Deſcendens*.

32. The Trunk of the *Arteria Cœliaca*, from whence ſpring

33, 33. The Hepatick Arteries, and

34. The *Arteria Cyſtica*, on the Gall-Bladder.

35. *Arteria Coronaria*, *Ventriculi Inferior*.

36. The *Pylorica*.

37. The *Epiploica Dextra*, *Siniſtra*, and *Media*, ſpringing from the *Coronaria*.

38. The Ramifications of the Coronary Artery, which embrace the bottom of the Stomach.

39. *Coronaria Ventriculi Superior*.

40, 40. The Phrenick Arteries, or the two Arteries of the Diaphragm, that of the left ſide ariſing from the Trunk of the *Arteria Magna*, the Right ſpringing from the *Cœliaca*.

41. The Trunk of the Splenick Artery, ariſing from the *Cœliaca*, contorted.

42. Two ſmall Arteries going to the upper part of the *Duodenum* and *Pancreas*; the reſt of the Arteries of the *Pancreas* ſpring from the Splenick Artery in its Paſſage to the Spleen.

43. The Trunk of the *Arteria Meſenterica Superior*, turn'd towards the right-ſide.

44, 44. The Branches of the Superior Meſenterick Artery, freed from the ſmall Guts; Here the various *Anaſtomoſes*, the Branches of this Artery make in the Meſentery before they arrive at the Inteſtines, may be obſerved.

45. The Inferior Meſenterick Artery ariſing from the *Arteria Magna*.

46. A remarkable *Anaſtomoſis* of this Inferior Meſenterick Artery with the Superior.

47, 47. The Branches of the Inferior Meſenterick Artery, as they paſs to the *Inteſtinum Colon*.

48. Thoſe of the *Rectum*.

49, 49. The Emulgent Arteries of the Kidnies.

50. The Vertebral Arteries of the Loins.

51, 51. The Spermatick Arteries, which deſcend to the *Teſtes*, and are ſo ſmall, as to eſcape being fill'd with Wax.

52. *Arteria Sacra*.

53, 53. *Arteriæ Iliacæ*.

54, 54. *Rami Iliaci Externi.*

55, 55. *Iliaci Interni*; which are larger in the *Fœtus* proportionably, than in the Adult, by reaſon of their Conjunction with the two Umbilical Arteries.

56, 56. The two Umbilical Arteries cut off: That of the Right ſide being drawn as in the *Fœtus*; the Left is expreſt as in an Adult.

57, 57. The Epigaſtrick Arteries, which aſcend under the right Muſcles of the *Abdomen*, and are inoſculated with the *Mammariæ*, as above noted.

58, 58. Branches of the External Iliack Arteries, paſſing between the two oblique Muſcles of the *Abdomen.*

59, 59. Branches of the Internal Iliack Arteries, which convey Blood to the *Extenſores* and *Obturatores* Muſcles of the Thighs.

60, 60. The Trunks of the Arteries which paſs to the *Penis.*

61, 61. The Arteries of the Bladder of Urine.

62, 62. The Internal Arteries of the *Pudendum*, which with thoſe here expreſt of the *Penis*, make the Hypogaſtrick Arteries in Women. The External Arteries of the *Pudendum*, ariſe from the upper part of the Crural Artery, which is immediately below the Epigaſtricks.

63. The *Penis* diſtended with Wind and dry'd.

64. *Glans Penis.*

65. The upper part, or *Dorſum Penis* cut from the Body of the *Penis*, and raiſed to ſhew the *Corpora Cavernoſa Penis.*

66, 66. *Corpora Cavernoſa Penis* freed from the *Oſſa Pubis*, and ty'd after Inflation.

67. The two Arteries of the *Penis*, as they appear injected with Wax, in each Cavernous Body of the *Penis.*

68. The *Capſula*, and *Septum* of the *Corpora Cavernoſa Penis.*

69. The Crural Arteries.

70, 70. The Arteries which paſs to the Muſcles of the Thighs and *Tibiæ.*

71. That part of the Crural Artery that paſſes the Ham.

72. The three large Trunks of the Arteries of the Leg.

73. The Arteries of the Foot, with their communicating Branch, from their Superior to their Inferior Trunk, as well as their communications at the extremity of each Toe like thoſe of the Fingers.

CHAP. XVI.

Of the BONES *in general.*

DEſigning to treat of the Parts for local Motion together, it will not be improper, for Method ſake, to give ſome account of what is peculiar to each Species by it ſelf.

I ſhall begin with the Bones, which are the Frame, and as it were the Timber-work, which ſuſtains the whole Machine; and in theſe I ſhall conſider their Membrane, Structure, external and internal, their Contents, and their Connexions with each other.

How a Bone is diſtinguiſh'd from other Parts, and what are its Characteriſtick Marks that appear to Touch and View, has been already told in the initial Chapter of this Work; where all the General Parts, as well fluid as ſolid, are in a few Words deſcrib'd. I come now to thoſe things which are more particular.

Perioſteum. Every Bone is cloath'd externally with a pretty tough, and extremely ſenſible Membrane, which covers the whole exterior Surface, and is common to the ſame upon all Bones of the Body, even the little ones within the *Tympanum* of the Ear not excepted. It is deriv'd from the *Dura Mater*, and conſiſts principally, tho' not wholly, of Fibres drawn from thence, which are rectilineal; beſides which, it receives ſome other Fibres (but not in equal Proportion to theſe) from the *Membrana Communis Muſculorum*, (or as Dr. *Havers* imagines, from the carnous Fibres of the Belly of the Muſcles) which interſect the former variouſly in different Parts. It is every where thin, tho' not alike ſo in all Parts. It adheres cloſely to the Bone, and in ſome Places is obſerv'd to ſend Fibres into the very Subſtance of it. Its principal Uſe ſeems to be to defend the Muſcles and Tendons from being fretted in their Action, by Attrition from the hard Subſtance of the Bones, and to give notice by its ſenſibility of any thing that might annoy the Bones, which are in themſelves inſenſible.

The external Face of the Bones, which appear upon the removal of this Membrane, has been deſcrib'd among the Parts in general.

Two ſorts of Bones. The Bones are of two ſorts, ſuch as have a notable Cavity within, which is fill'd with a ſort of Fat, call'd Marrow, as the Bones of the Arms and Legs, *&c*, or ſuch as have no ſuch Cavity or Marrow, as the Bones of the Skull and Ribs, *&c.*

Texture. Both theſe ſorts of Bones are laminated, or conſiſt of ſeveral *Strata* or rigid Fibres, which are of the ſame Subſtance with the whole aggregate of the Bone, ſtrictly ſo call'd, of which moſt are longitudinal, but interſected with croſs Bars or Fibres of the ſame Matter; whence are form'd *Loculi*, or little Cavities, which are fill'd with a ſort of Oil, which ſerves to keep them from being too brittle and plyable.

Oil, how ſeparated. This Oil, which is the thinneſt and moſt fluid part of the Fat, is ſeparated from the Blood, (convey'd by the Arteries thro' peculiar Perforations, made peculiarly for them, which the Veins return after the Separation of the Oil,) by means of certain little Veſicles lodg'd in theſe *Cellulæ*, and in this Hollow of the great Bones, which are or do the Office of Glands in this Caſe.

Marrow. The great Bone of the Arm and Leg have large Cavities within their *Parietes*, fill'd with a peculiar ſort of Fat, call'd the *Medulla*, or Marrow of the Bones; which is contain'd in innumerable *Sacculi*, or membranous Bags, which are continu'd to, and open into one another, and make the whole appear as one Body or Lump. At each end of theſe Bones is one or more Perforations, thro' which part of this Fat is diſcharg'd into the Joynts, of which by and by.

Thoſe Bones which have no ſuch Hollow and Marrow, have however, like theſe, laminated *Parietes*, tho' not ſo thick, and between them a ſort of ſpongy cavernulous Subſtance, which receives from the Veſſels, as the others do, a greaſy Subſtance, which ſerves for their Nouriſhment and Maintenance.

CHAP. XVII.

Of the Connexion of the BONES.

ALL the Bones of the Body (which, tho' differing in number in ſeveral Subjects, are however above three hundred in thoſe that have feweſt) are joyn'd together, and make one *Compages* or Frame.

The manner likewiſe of their being joyn'd is various, according to the purpoſes for which they are put together; ſome being deſign'd for Motion, others for Reſt, and the ſupport of the incumbent Parts only.

Arthroſis. That juncture, which is deſign'd for Motion, is call'd *Arthroſis* or Articulation, and is again divided into two ſorts; one, which has a notable Diarthroſis. and manifeſt Motion, which is call'd *Diarthroſis*; and the other, which has an obſcure one Synarthroſis. only, and is call'd *Synarthroſis*.

The *Diarthroſis* is again ſub-divided into three ſorts of Articulation, *Enarthroſis*, *Arthrodia*, and *Ginglymus*.

Enarthroſis. It is call'd *Enarthroſis*, when a large protuberant Head is inſerted into ſome deep Cavity, which is call'd *Cotyle*, or *Acetabulum*, or in *Engliſh* a Socket.

Arthrodia is, when a flat Head is receiv'd in a ſhallow Socket; as in the inſertion of the *Os Humeri* into the *Scapula*. Arthrodia.

Ginglymus is, when a Bone inſerts itſelf into another, and receives a third or the ſame. Ginglymus.

The *Ginglymus* is again ſub-divided into three ſorts.

The firſt is, when two Bones mutually receive one another, as thoſe of the *Cubitus* and *Humerus* do, like a Hinge.

The ſecond is, when it receives one Bone, and is receiv'd by another; as the *Vertebræ* do.

The third is, after the manner of an *Axis* of a Wheel in a Box, as the firſt *Vertebræ* of the Neck, with the ſecond.

The *Synarthroſis*, which has but an obſcure Moti[illegible] divided into *Symphyſis*, *Sutura*, *Harmonia*, [illegible]*oſis*, *Syſſarcoſis*, *Syncondroſis*, *Syneuroſis*, *Sy*[illegible]*oſis*, *Synymenſis*. Synarthroſis.

That juncture of the Bones, which is for abſolute Reſt, is call'd *Symphyſis*, or Coalition, of which there are likewiſe three ſorts. Symphyſis.

Raphe or *Sutura*, which is when Bones are joyn'd by uneven Edges, and are as it were indented; or ſometimes ſhooting over each other. Sutura.

The ſecond ſort is call'd *Harmonia*, which is when the Bones meet with even Margins in a Line, as thoſe of the upper Jaw. Harmonia.

The third is *Gomphoſis*, which is like fixing a Peg or Nail into a Hole, which ſort of joynting is proper to the Teeth only. Gomphoſis.

There are, beſides theſe, five other ſorts of Connexions. The firſt of which is called *Syſſarcoſis*, which is when the Bone is joyn'd to, or by a fleſhy Part, as the *Os Hyoides*. Syſſarcoſis.

Synchondroſis. The ſecond is *Synchondroſis*, which is by an intermediate Cartilage, as the Ribs are join'd to the *Sternum.*

Syneuroſis. The third is *Syneuroſis*, which is a Connexion by a Ligament, as is that of the *Os Femoris* to the *Os Iſchii.*

Syntenoſis. The fourth is *Syntenoſis*, which is join'd by a Tendon, as the *Patella* is to the *Tibia*, the *Oſſa Seſamoidea*, &c.

Synymenſis. The fifth is *Synymenſis*, and is a Conjunction by Membranes; as in new-born Children, the *Oſſa Syncipitis* are join'd with the occipital and frontal Bones.

Sutura Vera. Spuria. The Junctures are likewiſe divided by Authors into Genuine and Spurious: The Genuine is that which is indented like the Teeth of two Saws, as the *Sutura Coronalis*, and *Lamdoides*; and the Spurious, is that which ſhoots over, as the *Sutura Temporalis.*

A
NEW SYSTEM
OF
ANATOMY.

BOOK IV.

CHAP. I.

Of the MUSCLES *and* Mucilaginous Glands *in general.*

AS the Bones are the Frame, and the Joints the Pullies or Hinges on which the Animal Machine moves; ſo the Muſcles reſemble the Chords which draw it to and fro.

Muſcles, Inſtruments of Motion.

The MUSCLES are the Inſtruments of voluntary Motion, and have been already ſo far deſcribed, as to their diſtinct Members, as not to need a repetition here.

Belly the active Part.

The Belly, which is the Part principally affected in the Actions of a Muſcle, conſiſts of carnous Fibres, which are now generally (how true ſoever) thought to be only Productions of the Arteries and Veins, by the Intumeſcence of whoſe

Contents the Extremities are drawn nearer together, and by conſequence the Bone to which the moveable Part is fix'd, is approximated to the immoveable, or leſs moveable.

Hypotheſis *not ſatisfactory.*

Many *Hypotheſes* have been offer'd to account for this voluntary Motion; but I, who muſt confeſs my Ignorance of the means by which the Soul acts upon the Body, cannot acquieſce in any of them, nor pretend to offer any of my own.

Some will have the Animal Spirits the *Primum Movens*; but beſides, that their Exiſtence is not to me demonſtratively prov'd, the manner of their Action aſſign'd by Authors is altogether arbitrary and precarious.

Some, after the great Dr. *Willis*, make the Tendons a Receptacle for the Spirits, which are to be rais'd at the Inſtigation of the Will, and ſent into the Body of the Muſcle, there to ferment with the Blood, and cauſe an Intumeſcence, by ſome fanciful way or other, they know not how.

Others, who allow no Receptacle for them but the Brains, ſend them from thence through the Nerves, like Lightning, on all the Errands of the Will; becauſe they cannot allow the Tendons to be a proper Lodgment, upon the account of the Cloſeneſs of their Contexture; nor can believe that the Spirits ſhould remain there unactive. But how right ſoever they may be in their Objection, they offer no more Demonſtration for their own Opinion, which is liable to as many Exceptions, were it worth while to amuſe the Reader with them.

It is certain from Fact, and ocular Demonſtration, that the Belly of the Muſcles does ſwell in its Actions, and that a Ligature laid upon the Artery or Nerve, that ſerves any Muſcle, will totally impede its Action. From whence it is plain, that both of them, ſome way or other, do contribute to it.

By Injection of warm Water through the Arteries, into the Muſcles of Bodies after Death, we find that Contractions may be procur'd; which, beſides the Experiments of Ligature, ſufficiently ſhew the ſhare that the Blood has in their Actions. But whether in living Bodies this Intumeſcence of the Muſcle proceeds from the extraordinary quantity of Blood irruent in the time of Action, or from any ſudden Expanſion of the ordinary quantity circulating through it, is hard to determine; ſince either Accident is poſſible, and the Cauſes of either equally obſcure.

But leaving the active Cauſe of voluntary Motion to thoſe that are better able to find it out, I ſhall proceed to the Deſcription of thoſe Parts, which have not been already mentioned in the general Idea of a Muſcle, in the firſt Chapter of this Work.

Beſides the common Teguments of the Muſcles, each Muſcle has a proper Membrane which encloſes the whole Muſcle, and is more ſtrictly wrapp'd about the Tendons.

The Body of the Muſcle conſiſts of fleſhy Fibres, which, according to the late receiv'd Opinion, are nothing elſe but the Capillaries of Arteries and Veins inoſculating with, or continu'd to each other. This Opinion, however receiv'd, appears in my Mind to be juſtly queſtionable; ſince, beſides the Membrane which encloſes the whole Muſcle, there are others (probably Productions of the ſame Membrane) which divide the Muſcle into innumerable *Faſciculi* or bundles of Fibres, which may, for any thing we have been able to trace, be ſerv'd only with one ſmall Artery and Vein; and this Diſpoſition ſeems more commodious for the Expanſion of the Blood in the Muſcle, than its Circulation thro' continual Tubes. In which Opinion I am countenanc'd by the Singularity of that Intumeſcence, and Detumeſcence, without Damage, which is proper to the Muſcles only; and not only proper, but neceſſary to their Action, and to theirs only of all the Parts of the Body.

This makes me think the Obſervations made by the Microſcope, upon the Circulation of the Blood, in the Tails of little Eels, Newts, Tadpoles, *&c.* no demonſtrative Proof of the Continuity of the Veſſels in every Part, ſince it is ſeen only in the edges and extremities, where the Blood is neceſſary only for Nutrition, and not in the muſculous or moving Parts.

Fat of the Interſtices of the Muſcles.

In the Interſtices of theſe *Faſciculi* of muſcular Fibres are plac'd ſmall Parcels of Fat, ſcarce perceptible to the naked Eye in a human Subject, but viſible enough by the help of a Microſcope. Theſe were however plainly enough diſcover'd by that accurate Anatomiſt Dr. *Tyſon*, in the Diſſection of a Porpeſs. Their uſe may reaſonably be ſuppos'd to be the Lubrication of thoſe Muſcles, or *Faſciculi* of Fibres, thereby to hinder them from fretting one another.

Mucilaginous Glands of the Muſcles.

Beſides this Fat, which is contain'd in ſmall Cells or Veſicles, are interſpers'd among theſe *Faſciculi* certain ſmall Glands, which, as Dr. *Havers* has obſerv'd, afford a ſmooth mucilaginous Juice, which, together with the Fat, contributes to lubricate theſe parts of the Muſcles.

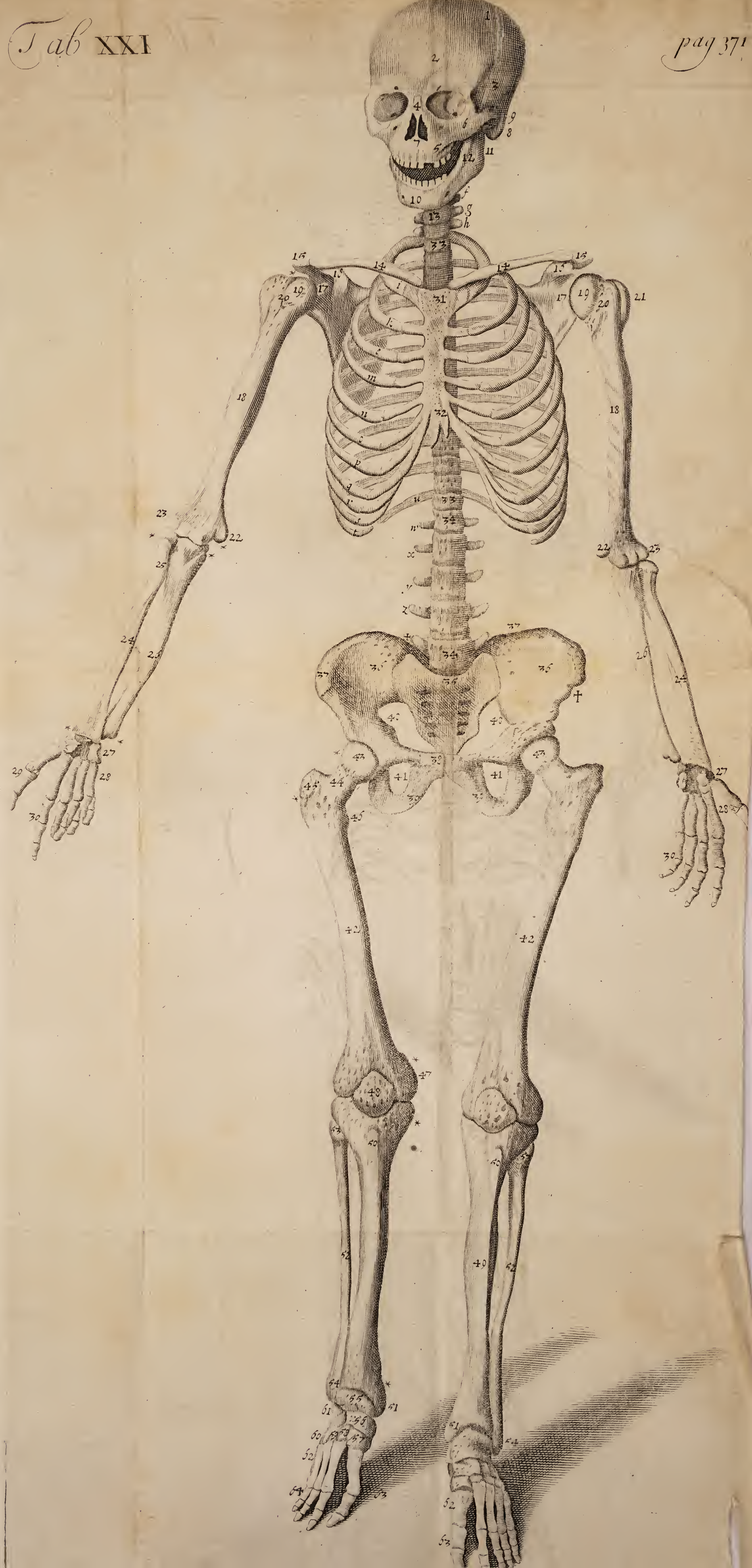
Mucilaginous Glands of the Joints.

Beſides the Muſcles, ſubſervient to the Motion of the Bones, are the mucilaginous Glands, of which there are ſome in every Articulation. But thoſe at the Articulations, *per Enarthroſin*, are conſiderable for their Magnitude, and lie at the bottom of the Concave Part of the *Acetabulum*.

Uſe.

They are of the conglomerate kind, and as thoſe of the Muſcles afford a Mucilage, which mixing with the Oil iſſuing from the Cavities of the

Tab XXI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Bones, thro' the Perforations before mentioned, ſerves to lubricate, and render the Cartilages more ſlippery and eaſy of Motion, as well as to keep them ſoft.

Ligaments. Beſides theſe Parts inſtrumental to Motion, are the Ligaments, which have nothing peculiar beyond the Deſcription already given, except their Originations and Inſertions, which will be ſpoken of in their proper Places.

TAB. XXI.

THE fore-part of the SKELETON of a MAN.

1, The *Os Sincipitis* or *Bregma.*

2, The *Os Frontis.*

3, The *Os Temporum* or *Squamoſum.*

4, The two Bones of the Noſe.

5, The fourth Bone of the upper Jaw.

6, The firſt Bone of the upper Jaw, or Cheek-bone.

7, The *Septum Narium.*

8, The *Proceſſus Maſtoides* or *Mammiformis.*

9, . . The *Os Jugale.*

10, 11, 12. The lower Jaw-bone; 10, that part of it called the Chin; 11, its Poſterior Proceſs, that is articulated to the *Os Temporum*, called *Condylus*; 12, the anterior Proceſs, call'd *Corone.*

13, The Bodies of the two inferior *Vertebræ* of the Neck; *f g h*, their tranſverſe Proceſſes.

14, The *Clavicula.*

15, The *Spina Scapulæ.*

16, The *Proceſſus Coracoides Scapulæ.*

17, The ſhort Proceſs of the *Scapula.*

18, 19, 20, 21, 22, 23, The *Os Humeri*, or Shoulder-Bone; 18, that part of it where the *Deltoides* Muſcle is inſerted; 19, its Head that is articulated with the Shoulder-blade; 20, the Aſperity where the *Muſculus ſubſcapularis* is inſerted; 21, a *Sinus* in the upper part of the Shoulder-bone, that receives the external tendinous Head of the *Muſculus Biceps*; 22, the internal Protuberance of the lower part of the *Os Humeri*, whence the two Muſcles bending, the *Carpus*, the *Pronator Radii Teres*, *Palmaris*, and *Muſculus Perforatus* of the Fingers do ariſe; 23, the external Protuberance of the laſt named Bone, whence the Muſcles extending the *Carpus* and Fingers ariſe.

24, 25, The *Radius*; 25, its Prominence, to which the large Tendon of the *Muſculus Biceps* is inſerted.

26, The *Ulna.*

27, The eight Bones of the *Carpus*.

28, The four Bones of the *Metacarpus*.

29, The three Bones of the Thumb, with their *Oſſicula Seſamoidea*.

30, The Bones of the Fingers, compos'd of twelve Bones, of which, three belong to each Finger.

31, The upper part of the *Os Pectoris*, or *Sternum*.

32, The lower part of the *Os Pectoris*, or *Cartilago Enſiformis*; which is ſometimes bifid, as it appeared in the Subject from whence this Figure was drawn.

33, 33, The *Vertebræ* of the Back, or *Thorax*.

34, 34, The *Vertebræ* of the Loins. *i, k, l, m, n, o, p, q, r, ſ, t, u.* The twelve Ribs.

u, x, y, z, ✠, The tranſverſe Proceſs of the *Vertebræ* of the Loins.

35, The *Os Sacrum*.

36, 37, 38, 39, The *Os Innominatum*, by ſome call'd *Coxendix*; 36, 37, that part of it called *Ilium*; 36, its internal Concave Part; and 37, its Spine; 38, the *Os Pubis*, or *Pectinis*; 39, the *Iſchi*, where it is joined to the laſt named Bone.

40, 40, The great *Sinuſſes* of the *Oſſa Ilium*, and Circumſcription of the *Pelvis Abdominis*.

41, The *Foramen* of the *Iſchium* and *Os Pubis*.

42, 43, 44, 45, 46, 47, The *Os Femoris*, or Thigh-Bone; 43, its Head, which is received into the *Acetabulum*, or *Cotyle* of the *Os Innominatum*; 44, the Neck of the Thigh-Bone; 45, the great *Trochanter*; 46, the leſſer *Trochanter*, where the *Muſculus Pſoas* and *Iliacus Internus* are inſerted; 47, the lower and internal Head of the Thigh-Bone, to which the ſtrong Tendon of the *Muſculus Triceps* is implanted.

48, The *Mola*, or *Patella*, by ſome called *Rotula*.

49, 50, 51, The *Tibia*: 50, a Prominence on its upper part, where the Tendon of all the extending Muſcle of the Leg are inſerted; 51, the *Malleolus Internus*.

52, 53, 54, The *Fibula* 53, 54, its ſuperior and inferior *Appendix*.

55, The *Aſtragalus*.

56, The *Os Cymbiforme*.

57, The *Os Cuneiform* *majus, ſeu internum*.

58, The *Os Cuneiform* *medium*.

59, The *Os Cuneiform* *externum*.

60, The *Os Cubiforme*.

61, Part of the *Os Cal* *in ſitu*.

62, The five Bones the *Metatarſus*.

63, The two Bones the great Toe.

64, The twelve Bones the leſſer Toes, of wh three compoſe each Toe

****, &c. The *Appe* *ces* of the *Spina Scapulæ*, *Humeri*, *Radius*, *Ulna*, *Femoris*, and *Tibia*.

Tab XXII

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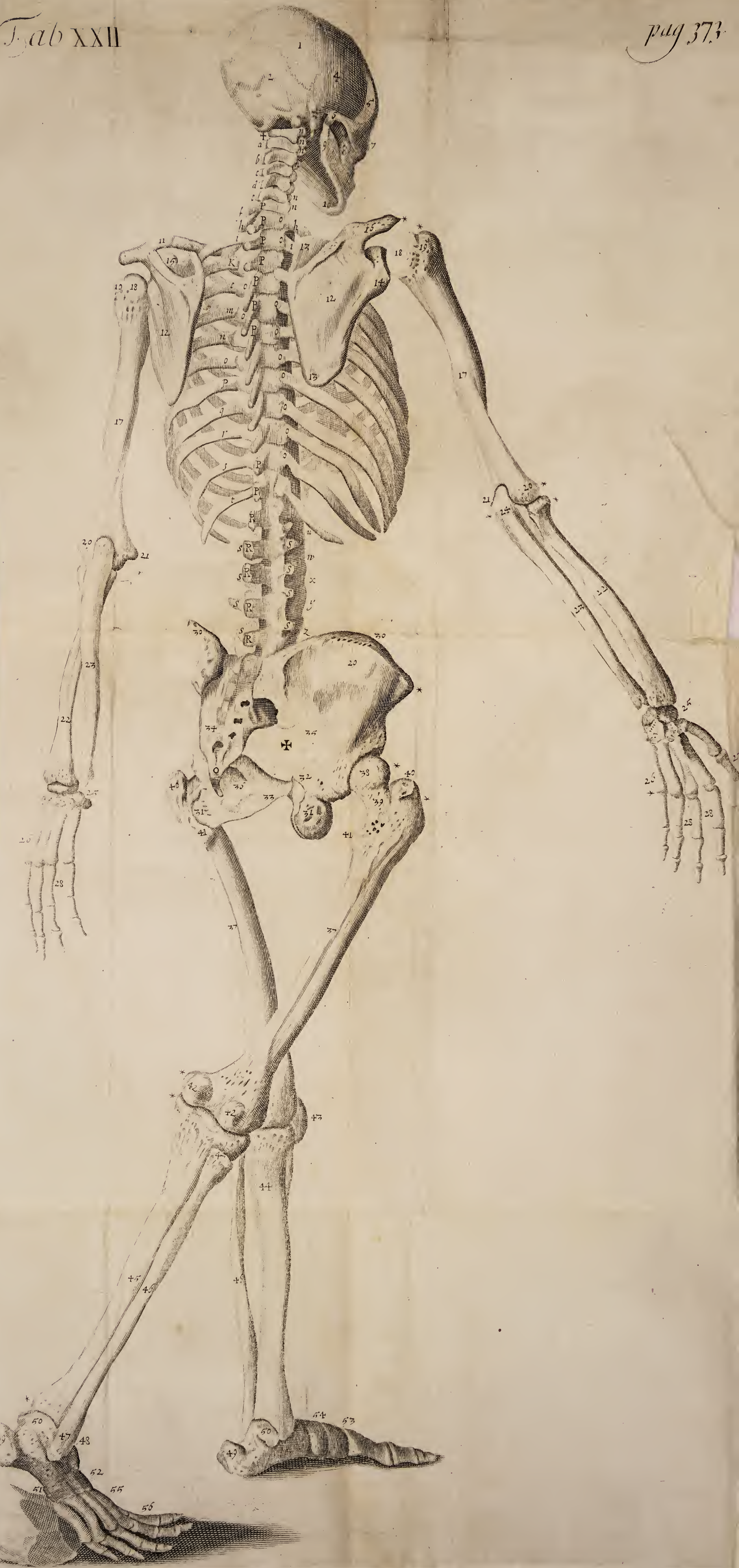

T A B. XXII.

THE Back and Side of the SKELETON of a WOMAN.

1, The *Os Sincipitis.*

2, The *Os Occipitis.*

3, The *Proceſſus Mammiformis.*

4, The *Os Squammoſum.*

5, Part of the *Os Sphenoides.*

6, The *Os Jugale.*

7, The firſt Bone of the upper Jaw.

8, Part of the fourth Bone of the upper Jaw.

9, 10, The lower Jaw-bone; 10, the internal Part of it, where the *Muſculorum par Genihyoideum* and *Geniogloſſum* do ariſe.

11, Part of the *Clavicula.*

12, 13, 14, 15, 16, The *Scapula* or Shoulder-blade; 13, 13, its *Baſis*; from 13 to 14, its *Coſta inferior*; 14, its *Proceſſus brevis*; 15, Part of the *Proceſſus Coracoides* on the left ſide, *in ſitu*; 16, *Spina Scapulæ.*

17, 18, 19, 20, 21, The *Os Humeri*; that part of it where the *Muſculus Brachiæus Externus* begins to ariſe; 18, the Head of the *Os Humeri*; 19, the Aſperity of the *Humerus*, where the *Muſculi Supraſpinatus*, *Infraſpinatus*, and *Teres Minor*, are inſerted; 20, the external Protuberance, whence the extending Muſcles of the *Carpus* and Fingers ariſe; 21, the internal Protuberance of the *Os Humeri*, where the Muſcles, bending the *Carpus* and Fingers, ariſe.

22, The *Radius.*

23, 24, The *Ulna*; 24, its ſuperior part, called the *Olecranum*, or the Elbow.

25, The eight Bones of the *Carpus.*

26, The four Bones of the *Metacarpus.*

27, The three Bones of the Thumb.

28, The Bones of the Fingers.

†, The firſt *Vertebra* of the Neck, wanting a Spinal Proceſs.

a, b, c, d, e, f, The Spinal Proceſſes of the other ſix *Vertebræ* of the Neck, of which the five ſuperior are double; between which are placed the *Muſculi interſpinales Colli.*

n, n, n, n, The tranſverſe Proceſſes of the *Vertebræ* of the Neck.

h, i, k, l, m, n, o, p, q, r, ſ, t, The twelve Ribs.

ooo, &c. The tranſverſe Proceſſes of the *Vertebræ* of the *Thorax.*

PPP, &c. Their Spines.

RRR, &c. The Spines of the five *Vertebræ* of the Loins.

SSS, &c. The tranſverſe Proceſſes of thoſe *Vertebræ.*

u, w, x, y, z, The Bodies of thoſe *Vertebræ.*

29, The back-part of the *Os Ilium*, by ſome called *Dorſum Ilium.*

30, The Spine of the *Ilium.*

31, The Protuberance of the *Os Iſchium*, whence the Muſcles bending the Leg do ariſe, namely, the *Seminervoſus Semimembranoſus*, and one of the Heads of the *Biceps*; together with the *Quadratus Femoris*, which latter is an Obturator.

32, An acute Proceſs of the *Iſchium*, between which and the laſt mentioned Protuberance 31, the Tendons of the *Muſculus Marſupialis* paſs, as on a Pully.

33, The Internal of the *Os Pubis*.

34, The *Os Sacrum*.

0, The *Os Coccygis*.

✠ The diſtance between the *Os Sacrum Ilium* and *Pubis* is here remarkable, being much greater in Women than in Men.

35, The large *Sinus* of the *Os Ilium*, wherein the *Muſculus Pyriformis* paſſes to its termination.

36, The great *Foramen* of the *Iſchium*.

37, 38, 39, 40, 41, 42, The *Os Femoris*; 37, Its *Linea Aſpera*; 38, Its Head that is received into the *Acetabulum* of the *Coxendix*; 39, The Neck of the Thigh-bone; 40, The *Trochanter Major*, to which divers Muſcles are inſerted; 41, The leſſer *Trochanter*; 42, 42, The two Inferior Protuberances of the lower *Appendix* of this Bone.

43, Part of the *Patella in ſitu*.

44, 45, The *Tibiæ*; 44, that part of the left, where the *Muſculus Sartorius*, *Gracilis*, and *Seminervoſus*, are inſerted.

46, 47, 48, The *Fibula*; 47, 48, its Superior and Inferior *Appendices*.

49, The *Os Calcis*.

50, The *Aſtragalus*.

51, The *Os Cuboides*.

52, The three *Oſſa Cuneiformia*.

53, The *Os Cuneiforme majus*.

54, The *Os Cymbiforme*.

55, The *Oſſa Metatarſi*.

56, The Bones of the Toes.

***, &c. The *Appendices* of the *Spina Scapulæ*, *Os Humeri*, *Radius*, *Ulna*, *Oſſa Metacarpi*, *Os Ilium*, *Femoris*, and *Tibia*.

CHAP. II.

Of the Bones *and* Muſcles *of the* Head.

Cranium. THE Head we divide into the Skull and Jaws.

Its Bones. The Skull conſiſts of eight Bones; ſix proper, and two common to the upper Jaw, which together, form that Cavity that contains the Brain.

Os Frontis.

The firſt of the Bones proper to the Skull is the Bone of the Forehead, call'd likewiſe *Coronale*, *Verecundum*, and *Os Puppis* : Its Figure is in a manner circular, and in Children, is divided by a Suture, which makes two of it, and is called the *Sutura Sagittalis*, which, in Adults, generally grows up ſo as to leave no Marks, though ſometimes it happens otherwiſe.

Sutura Sagittalis.

Connexion.

It is joyn'd to the Bones of the *Sinciput* by the Coronal Suture, which is of the Indentate kind, and one of thoſe which is call'd the true Suture. Below to ſeveral Bones of the under Jaw by the *Sutura Tranſverſalis*, and to the *Os Sphenoides* by the Sphenoidal Suture.

Tabulæ Oſſis Frontis Sinus duo Membrana Pituitaria.

It conſiſts of two Tables, betwixt which, juſt above each Eye-brow, are two Cavities or *Sinus*, which are lin'd on the out-ſide with a thick double Membrane, furniſh'd plentifully, with Glands and Blood-Veſſels, which ſeparate part of that *Mucus* which falls into the Noſe into which they open.

Foramina.

It has three conſiderable Perforations, one inwardly juſt above the *Septum* of the *Os Cribroſum*, which ſeems to communicate with the forementioned *Sinus* and the Noſe; and two juſt above the upper part of the Orbit of the Eye, through which the Blood-Veſſels paſs, and a Branch of the fifth pair of Nerves.

Proceſſus.

This Bone has four Proceſſes; on each ſide two, at the corners of the Eyes, forming the upper Orbit of the Eye : Beſides which, ſome reckon two other Prominences towards the Temples.

Frontales.

The Muſcles which belong to this Part, are the *Frontales*; which ſpring from the upper part of this Bone, and ſerve to raiſe the Eye-brows, and corrugate the Skin of the Fore-head.

Oſſa Sincipitis, ſeu Bregmatis.

But theſe have been already deſcrib'd among the external Parts of the Face.

The next are the two Bones of the *Sinciput*, call'd likewiſe *Oſſa Parietalia*; which are of an irregular Square Figure. *Connexion.* They are join'd to the *Os Frontis* by the Coronal Suture, to the Occipital Bone by the Lambdoidal, and to the Temporal by the *Sutura Squamoſa*, which is of that kind which is not reckon'd genuine; and to each other by the Sagittal Suture: All which, except the *Squamoſa*, are in new-born Children open, and cloſe in Proceſs of time. Sulci. The inſide of this Bone has ſeveral Furrows, made while it is tender by the impreſſion of the Blood-Veſſels, which run over the *Dura Mater*; which are deepeſt towards the Temporal Bones, and are in a manner obliterated upon the top of the Head.

Foramina.

They have each a ſmall Perforation near the Sagittal Suture, thro' which the Blood-Veſſels paſs to the *Sinus Longitudinalis*.

Os Occipitis, ſeu Proræ.

The Fourth is the *Os Occipitis* (which thro' the Bone of the hinder part of the Head is improperly call'd *Os Proræ*, as that of the Forehead is *Os Puppis*) and is of a triangular Figure, and the thickeſt of the proper Bones of the Head. *In Infants four.* In new-born Children it is divided into four, but grows up and becomes one in time.

Connexion.

It is join'd to the Bones of the *Sinciput* at the Lambdoidal Suture; as likewiſe to the *Petroſa*, and to the *Os Sphenoides*, at the Sphenoidal Suture.

Sinus duo.

Its Convex part is divided into two large *Sinus* for the reception of the *Hemiſpheres* of the *Cerebellum*: Sulci. And two large *Sulci*, or Furrows, in which lie the *Sinus Laterales*.

Foramina.

This Bone has ſeven Perforations; one of which is very large, for the egreſs of the *Medulla Spinalis*, and has on each ſide of it two little ones, through two of which enter the Cervical Arteries, and through the other two go out the Nerves, which ſerve for the Motion of the Tongue: The other two, which are common to this Bone and the *Os Petroſum*, on each ſide are the outlets of the *Sinus Laterales* and *Par Vagum*.

Proceſſus. On each ſide of the great *Foramen*, is a Proceſs lin'd with a Cartilage, which is articulated with the firſt *Vertebra* of the Neck, and generally a third about the middle of it; though this is ſometimes wanting, and in the room of it only a Prominence of the Bone, which, or the Proceſs where it is found, receives the Inſertions of the Muſcles of the Head, of which there are ten Pair.

Par Splenium. The firſt of theſe is the *Par Splenium*, ſo called, from the reſemblance ſome have imagined it to bear to an Ox's Spleen. It ariſes partly tendinous, partly fleſhy, from the Spines of the four Superior *Vertebræ* of the *Thorax*, and from the two lower of the Neck; the former part aſcending obliquely, becomes again tendinous at the ſecond, third and fourth Tranſverſe Proceſſes of the Neck, to each of which it has an Inſertion: The latter likewiſe aſcends obliquely outwards, and growing fleſhy, is inſerted into the Bone of the *Occiput*; part of it lying under the Inſertion of the *Muſculus Maſtoideus*.

Common to the Head and Neck. This, though reckoned amongſt the Muſcles proper to the Head, is common to the Neck; the ſecond or third *Vertebra* of which, they muſt certainly move in their Action; either of them moving ſeparately, draw the Head and Neck obliquely backwards, together, they pull it directly back. *Action.*

Par Complexum. The next is the *Par Complexum*, which ariſes with ſix thin ſmall Tendons from the Tranſverſe Proceſſes of the *Vertebræ* of the Neck and *Thorax*,

rax, growing fleſhy in its aſcent, becomes again Tendinous about the middle, and then again becoming fleſhy is inſerted laterally into the upper part of the *Os Occipitis*, and the hinder part of *Action.* the *Proceſſus Maſtoides.* Theſe, as the former, acting together, pull the Head backwards, but either of them acting ſeparately, draws it obliquely back.

Par Tertium Fallopii are not always found diſtinct, but being ſo in ſome Bodies, it's ſufficient only to take notice that they ariſe with five ſmall flattiſh Tendons on each ſide from the firſt tranſverſe Proceſs of the *Thorax*, and four inferior of the Neck, and becoming fleſhy in their aſcent, joyn in moſt Subjects with the upper part of the *Dorſi Longiſſimus*, and are inſerted to the *Os Occipitis* near the Mamillary Proceſſes.

Par Rectum Majus Externum.

The *Par Rectum Majus* ariſes Fleſhy and Tendinous from the upper part of the double Spines of the ſecond *Vertebra* of the Neck, and ſpreading in its aſcent, is inſerted into the poſterior *Action.* Part of the *Os Occipitis.* Theſe Muſcles draw the Head directly back upon the firſt *Vertebra.*

Par Rectum Minus Externum.

The *Par Rectum Minus* are two ſmall Muſcles, ariſing fleſhy from the hinder part of the firſt *Vertebræ* of the Neck, are inſerted into the middle of the *Os Occipitis.* *Action.* Theſe likewiſe draw directly backwards.

Par Obliquum ſuperius.

The *Par obliquum ſuperius*, ſprings fleſhy from the tranſverſe Proceſſes of the ſecond *Vertebræ* of the Neck, and aſcending obliquely, *Action.* is inſerted laterally into the *Os Occipitis.* Theſe move the Head backwards upon the firſt *Vertebra.*

Obliquum Inferius.

The *Obliquum Inferius* riſes fleſhy from the external Part of the Spine of the ſecond *Vertebra* of the Neck, near the Origination of the *Muſculus Rectus Major*, and ſwelling into a fleſhy Belly, runs obliquely to the tranſverſe Proceſs of the firſt *Vertebra*. This has not improperly been reckoned among the Muſcles of the Neck: However, ſerving to turn the Head about, moſt Authors have given them a Place among the Muſcles of the Head. *Action.*

Par Maſtoideum. *Par Maſtoideum* is ſo nam'd from its Inſertion into the *Proceſſus Maſtoides*. It has likewiſe another Inſertion into the *Os Occipitis*, which gives it a place here. It ariſes partly tendinous, and partly fleſhy, from the upper part of the *Sternum*, and near half the Clavicle, with two (as it were diſtinct) Originations; the firſt aſcending ſomewhat obliquely outwards, joyns with the ſecond, and marching thence directly upwards, makes a round, thick, fleſhy Body; thence paſſing over the upper part of the *Levator Scapulæ* it ſpreads again, and is inſerted into the *Proceſſus Mamillaris* and *Os Occipitis* by the *Splenius*. Theſe Muſcles are in a manner Antagoniſts to each other, and ſerve to draw the Head to either ſide, as the Acting Muſcle is employ'd. *Action.*

Rectum internum majus. App. Tab. xl. Fig. iii. The *Rectum internum majus* (not known by the Name of *majus*, till diſtinguiſhed by Mr. *Cowper*, upon the account of another Pair which he found reaſon to call *Rectum internum minus*) comes from the fore-part of all the tranverſe Proceſſes of the *Vertebræ* of the Neck, except the firſt and ſecond. In its Aſcent it becomes fleſhy and running over the two upper *Vertebræ*, is inſerted into the *Anterior* Proceſs of the *Os Occipitis*, near the great *Foramen*. This draws the Head forward, and is rightly call'd *Flexor Capitis*. *Action.*

Rectum internum minus. The *Rectum internum minus*, is a Pair of Muſcles diſcover'd by Mr. *Cowper*, ariſing from the fore-part of the firſt *Vertebra* of the Neck, and inſerted into the fore-part of the *Os Occipitis*, immediately under the foregoing. This Pair is properly Antagoniſt to the *Rectum minus*, on the back part of the Neck and Head, and ſerves to *Actions.*

nod the Head, or draw it forwards and downwards; and therefore theſe Muſcles are properly enough named by Mr. *Cowper*, *Annuentes*.

Rectum Laterale.

The laſt Pair, which is inſerted into the *Os Occipitis*, is the *Rectum Laterale*; which is a ſhort thick fleſhy Muſcle, riſing from the ſuperior part of the Tranſverſe Proceſſes of the firſt *Vertebra* of the Neck, between the laſt deſcrib'd and the *Obliquum ſuperius*; from whence it aſcends to that part of the *Os Occipitis*, which is between the *Proceſſus Mamillaris* and *Styloides*. Theſe move the Head laterally towards either Shoulder, acting together, they are Antagoniſts to one another, and keep it ſteady.

Action.

Oſſa Temporum Tab. xviii. Fig. I. D.

The two remaining proper Bones, are thoſe of the Temples; which are of a Figure near circular. The fore and upper parts of them are very thin, conſiſting only of one Table; the lower and hinder parts are thick, hard and uneven. They are join'd to the *Os Sincipitis* by the *Sutura Squamoſa*, and on the lower part to the *Os Occipitis* and *Sphenoides*; to which latter, as likewiſe to the Bones of the upper Jaw, they are join'd by means of ſome Proceſſes, in which part they are call'd *Oſſa Petroſa*. Each of theſe Bones has two *Sinus*; the exterior of which is lin'd with a Cartilage, and receives the Proceſs of the lower Jaw: The Interior receives the lower part of the *Sinus Laterales* of the *Dura Mater*.

Hence Os Squamoſum.

Oſſa Petroſa.

Sinus.

Proceſſus.

Each of theſe Bones has four Proceſſes; three external, and one internal.

Os Jugale. Tab. ib.

The firſt uniting with a Proceſs of a Bone of the upper Jaw, makes that bony Arch between the Ear and the Eye, which is call'd *Zygomaticum*, or *Jugale*; under which lies the Tendon of the *Muſculus Crotaphytes*, where it joins with the *Maſſeter*.

The

Proceſſus Mamillaris. Tab. ib.

The ſecond is a ſhort, round, blunt Proceſs, behind the *Meatus Auditorius*, call'd from its Figure *Maſtoides*, or *Mamillaris.*

Os Styloides. Tab. ib.

The third is a long, ſharp, ſlender Proceſs, named likewiſe from its Form *Styloides.* Some of theſe Proceſſes have Muſcles ariſing from, or inſerted into them, which have been already deſcribed.

Os Petroſum.

The internal Proceſs is pretty long and large, containing the whole Internal *Meatus Auditorius*, and Cavity of the *Tympanum*, and is that Part which is peculiarly call'd the *Os Petroſum*, of whoſe *Sinus*, Membranes, and other Parts, we have already ſpoken at large. *Chap.* 12. *Book* III.

From this Bone, the *Crotaphytes*, or Temporal Muſcle has in part its Original; but ſerving for the Motion of the lower Jaw, we ſhall refer it thither.

Foramina. *Proper.*

The Temporal Bones have ſeven Perforations; of which four are proper, and three common. Theſe are likewiſe ſome of them external, and ſome internal. Of the firſt ſort is the *Meatus Auditorius externus*, which is pretty large. The ſecond is the *Meatus ad Palatum*, from the Barrel of the Ear to the *Fauces.* The third admits a Branch of the *Carotid* Artery to enter the Skull. The fourth is the Paſſage for the Auditory Nerve. Theſe four are proper; three external, and the laſt internal.

Common.

The common Perforations, are, firſt a pretty large one between the Proceſs of the *Os Petroſum* and *Os Occipitis*, through which paſſes the *Lateral Sinus* of the *Dura Meninx.* The ſecond is near the ſame ſize between the extremity of the *Os Petroſum* and *Os Sphenoides*, which receives the *Carotid* Artery. The third, which is leſs, is ſituated at the ſide of the former, between the Proceſs of the *Petroſum*, and the greater Proceſs of the *Baſilare*, or *Sphenoides*, through which paſſes a Branch of the Vein from the *Dura Mater* to the Jugulars.

Bones common. The two Bones common to the *Cranium* and upper Jaw, are the *Os Sphenoides*, or *Cuneiforme*, call'd alſo *Baſilare*, and the *Ethmoides*, or *Cribroſum*.

Sphenoides. Tab. xlix. Fig. iv. & iii. The *Sphenoides* is ſituated at the bottom or *Baſis* of the Skull, from whence, by a barbarous *Latin* Term, it has been called *Baſilare.* It is commonly reſembled to a Wedge, though the Imagination muſt be pretty aſſiſtant to make out Similitude; it is joyned to all the proper Bones of the Skull, though to the *Sinciput* but by a very ſmall *Superficies.* Its Juncture is called the Sphenoidal Suture. On the ſides it is, as it were, continued to the *Os Petroſum per Symphyſin.*

Proceſſes. In Infants it conſiſts of four Bones, which in Adults become one; which has ſeveral Proceſſes, ſpread partly over the Palate, and partly over the ſides of it. Two of theſe are broad and thin, like a Bat's Wing, and therefore called *Pterygoides*, and *Alæ Veſpertilionum:* And at the lower end two others, incurvated like Hooks, upon which are turned the Tendons of the *Muſculi Pterygoſtaphilini:* Beſides which, is a little one on its outſide, ſomewhat reſembling the *Criſta Galli*, ſituate in a ſmall Cavity at the farther end of the *Vomer.* There are other called *Clinoides*, betwixt which is a *Sinus*, which is called *Sella Equina*, and *Turcica*, which contains the *Glandula Pituitaria*, a ſmall Gland into which opens the *Infundibulum.* Tab. xviii. Fig i. Pterygoides. Tab. xvii. Fig. ix. Sella equina. Glandula

Pituitaria. Foramina. *Proper.* This Bone has ſeveral Perforations, of which ſeven on each ſide are pretty conſpicuous: Five proper to this Bone, and two common to the *Os Petroſum*; almoſt viſible on the inſide. The firſt Pair is in the fore-part of it, and affords a Paſſage for the Optick Nerves: The ſecond are juſt behind the former, and in the form of a Slit; which convey the *Motorii Oculorum*, together with a Branch of the *Carotids* to the Eyes, as likewiſe a Twig of the fifth Pair. The third Pair, which are ſmall, round Perforations, make way likewiſe for Branches of the fifth Pair of the Nerves: As does likewiſe the fourth; which is placed a little lower and forwarder than the former, and is, as it were, a Continuation of the *Foramen lacerum*, and carries a part of the fifth Pair of Nerves, to the Palate and Teeth of the upper Jaw. The fifth is nearer the *Os Petroſum*, and conducts likewiſe a Branch of the fifth, with a Twig of the ſixth to the Tongue and lower Jaw. Of the two common Pair, the greater gives entrance to the *Carotids*; the leſſer lets out a Branch of the internal Jugular. *Common.*

Ethmoides. App. Tab. xlix. Fig. iii.

The other common Bone is the *Ethmoides*, or *Cribroſum*; ſo call'd, becauſe it is pierced with a great number of ſmall Holes, like a Cullender. It is ſituated in the middle of the *Baſis* of the Forehead, and gives paſſage to the Fibres of the Olfactory Nerve, which are hinder'd from preſſing upon one another by a ſharp *Apophyſis* in the middle of this Bone, call'd *Criſta Galli*. *Vid. Chap.* 10. *Book* III.

Criſta Galli.

C H A P. III.

Of the BONES *and* MUSCLES *of the* JAWS.

THE Jaws are conſtantly divided into the Upper and Under, from which moſt of the Muſcles ſpring which make the external part of the Face.

Maxilla Superior. Tab xviii. Fig. i

Os Jugale

The upper Jaw is immoveable, but with the whole Head, and conſiſts of eleven Bones proper, joyn'd to each other *per Harmoniam*. The

Bones of the firſt Pair, are of a Figure betwixt ſquare and triangular, an irregular Square approaching to a Triangle. Theſe make on each ſide part of the lower Orbit of the Eye, particularly, the external *Canthus*; and ſend out thoſe Proceſſes that make part of the *Os Jugale*, from whence ſome have call'd this Bone it ſelf *Zygoma*.

Tab. ib. The ſecond is a ſmall thin Bone, very brittle, and almoſt pellucid, and therefore ſeldom to be found in the Skulls that have been buried. This makes the inward *Canthus* of the Eye, through which is a Paſſage to the Noſe, call'd *Punctum Lachrymale*. Whether this properly belongs to the Jaw or not, we leave to thoſe that love ſuch Speculations. Foramen Lachrymale.

Third Pair. The third Pair are likewiſe very thin, and are thoſe which make the Bones of the Noſe. *P.* 307.

Os Malæ. The fourth Pair is the largeſt of the upper Jaw: They make a great part of the lower Orbit of the Eye, and of the Palate, and contain the upper Teeth; for the reception of which, there are Hollows or Sockets, anſwering in number to the Teeth. Its Cavity, called *Antrum Maxillæ Superioris*, is mentioned in the Deſcription of the Cavities of the Noſe, *Chap.* 10. *Book* III.

Fifth Pair. The fifth Pair is ſituate at the bottom of the Palate, where the great Perforation is from the Noſe. Upon theſe the Palate is ſpread, and therefore they are properly called Bones of the Palate. Theſe are thin Bones, but very hard and ſolid.

Vomer. The eleventh and laſt Bone is the *Vomer*, or Ploughſhare; which ariſing from the upper part of the inſide of the Palate, divides the Noſe lengthways, and is therefore called the Bridge of the Noſe: In which, and the Parietal Bones of the Noſe, a *Caries* ſometimes happens, which occaſions that which we call the Falling of the Noſe; which ſometimes likewiſe affecting the Muſcles that cover them, occaſions the loſs of the Tip, or half the Noſe.

Muſculi Pterygopalatini.

Under the Bones of the Palate, run the *Muſculi Pterygopalatini*; which have been already deſcrib'd.

To the upper Jaw are fixt ſixteen Teeth, of which hereafter.

The lower Jaw. App. Tab. xlix. Fig. i.

The lower Jaw, in Children, conſiſts of two Bones, which in Adults unite ſo firmly together, as to ſeem but one. In Children their Juncture is *per Synchondroſin*, by a Cartilage intermediate at the Chin and fore-part of the Jaw; which Cartilage afterwards becoming Oſſeous, makes it a Juncture *per Symphyſin Harmonicam* ſo cloſe, as if they were glu'd together, and ſo united, bear ſomewhat of the Figure of the Greek Letter *υ*.

Subſtance.

It is a thick, hard Bone, conſiſting of two Tables; betwixt is a ſpongy Subſtance which in Children is Medullous. The fore-part is ſhallow, juſt ſufficient to afford Sockets for the Teeth; the hinder is deep, and has on each ſide two Proceſſes, which are called *Cornua*, ſhooting upwards. The foremoſt of which is called *Corone*, and receives the Tendon of the Temporal Muſcle: The hinder is nam'd *Condyloides*, and is guarded with a Cartilage. It is articulated with that part of the Temporal Bone, which is called *Petroſum*; upon which, as a Hinge, the lower Jaw moves, by the mediation of a moveable Cartilage, placed in this Articulation.

Proceſſes. Corone. Condyloides. App. Tab. xlix. Fig. i. X. Y.

Foramina.

It has four Perforations, on each ſide two; one on the outſide, which is the hinder and largeſt near the Proceſſes, which receives a pretty large Branch of the fifth Pair of Nerves together with an Artery and Vein, which running the whole length of the Jaw, ſend a Twig to each Tooth. In the fore-part is another, by which the ſame Veſſels come out again, and are diſpers'd into the Lips, and its Muſcles and Skin.

Teeth. In this Jaw, as in the upper, are ſixteen Teeth; which in either Jaw are fixt in peculiar Sockets, by that ſort of Juncture which is call'd *Gomphoſis*, by Joiners call'd Pegging, upon the account of the Gums, which ſerve to fix them in theſe Sockets: They may likewiſe be reckon'd to join as *per Syſſarcoſin.*

Alveoli.

How faſtned.

How looſened. This uſe of the Gums appears moſt plain in Morbid Caſes, ſuch as Scorbutical; in which when the Gums grow big and ſpongy, the Teeth are very apt to fall out: As they are likewiſe in artificial *Ptyaliſms*; when, by the too great Flux of Humours thro' thoſe Parts, their Subſtance is relaxt, and generally by the acrimony of the Humours or Medicines ulcerated: Perhaps in thoſe Caſes the extraordinary afflux of Humours may ſoften and dilate the Sockets. But upon what occaſion ſoever it be, that the Gums either deſert the Teeth, or become over-lax or ſpongy, the Teeth themſelves are found to ſtand but very looſely, and ſubject to be turn'd out of their Sockets by any little Accident.

Membrane. The Sockets, in which the Teeth are placed, are lined with a Membrane of exquiſite Senſe, which ſeems to be nervous, and is wrapt about the Roots of each Tooth: From whence, and the Nerve, proceeds that Pain which is call'd the Tooth-ach; the Teeth themſelves being altogether inſenſible.

Subſtance. The Teeth are the hardeſt and moſt poliſh'd Bones of the whole Body, without any *Perioſteum* in the prominent part; approaching in Conſiſtence and Splendor to Ivory, which is the Tooth of an Elephant.

Number. They are ordinarily ſixteen in each Jaw; tho' the Number may be ſometimes leſs in thoſe that have loſt none.

Sorts, Inciſores. Canini. Molares. App. Tab. xlix. Fig. i.

The Teeth are of three ſorts: Thoſe in the fore-part of each Jaw are called *Inciſores*, and ordinarily four in number in each Jaw, which are broad, thin, and ſharp: Behind which, on each ſide of the Jaw, ſtand two, which are a little more prominent and pointed, and call'd *Canini*: Behind theſe are five in a row, on each ſide of each Jaw, which have a broad, flat Superficies, and are call'd *Molares*, or Grinders: Theſe, in Men, are the Teeth of moſt Importance, as ſerving chiefly for Maſtication; tho' other carnivorous Animals, which live by Prey, and do not chew their Meat long, have more occaſion for the *Canini* and *Inciſores*.

Root.

The *Inciſores* have generally but a ſingle Root; the *Canini* ſometimes a double one; the *Molares* being put to greater Streſs and Service, have ſometimes three, and ſometimes four, eſpecially the hinder; which being nearer the *Vice* or Hinge of the Jaw, are put to greater Service. Theſe being in Men moſt employed, are the firſt generally that decay.

Time of breeding. Inciſores.

The Jaws are ſeldom fully furniſh'd with them till about three Years of Age, tho' the time of their Eruption be very uncertain and irregular. The firſt that appear are the *Inciſores*; which begin to ſhew themſelves frequently at ſeven or eight Months, and ſometimes much earlier. Some indeed have been born with all their Teeth, which is look'd upon as a monſtrous Caſe.

Canini. Molares.

The *Canini*, which are by the Women call'd the Eye-Teeth, appear ſomewhat later. And laſt of all, the *Molares*; which do not uſually come all at a time, and often with ſuch Difficulty and Pain, that if their Eruption be not carefully watched and aſſiſted, it coſts the Infant's Life.

Danger in Dentition.

No Accident to which they are ſubject coſts the Life of more Children than Dentition; the

Pain, and other Attendants of which, frequently throw them into Epileptick Fits, which ſometimes carry them off almoſt in an inſtant. Dentition ought therefore to be carefully watch'd, and not truſted to the ſole Security of whetting the Gums with a bit of Coral, or fooliſh, ſuperſtitious Amulets, ſuch as *Pæony* Roots, or the like; but whenever the Gum appears to be ſwell'd and painful, the Eruption of the Tooth ſhould be facilitated by opening of it with a Lancet, or ſome more proper Inſtrument, ſuch as is now in uſe for that purpoſe: In the uſe of which, care ſhould be taken to reach the Tooth itſelf, that the Membrane immediately covering it (from which the Pain principally ariſes) may certainly be divided, and the Gum not ſuperficially only wounded, as it generally is when old Women undertake this Operation with their *Harry* Groats. This alone is not ſufficient in difficult Dentition, which is uſually attended with a Fever, and a Superfluity of Humour, and frequently a *Diarrhœa.* But the Direction in ſuch Caſes belongs to Practice, and muſt be left to skilful Phyſicians, who will know whether Evacuation by Stool (as it often is) be neceſſary, or any other Method.

Change. Ordinarily at the Age of ſeven, eight, or nine Years, the firſt Set of Teeth are thruſt out by a race of Succeſſors, which (the way being already made for them) come out eaſier; tho' ſometimes, when they come at an Age more advanced (as they will now and then) they do it with Pain and Difficulty; becauſe the Head of the Tooth being broader than the Roots of that which ſtands over it, the Membrane, which was conform'd to the Figure of the former, is extraordinarily diſtended, which always produces Pain.

Decay. The time of their Decay is uncertain; but generally in Age they fall out, either by their own Corruption, (which they are very liable to, as appears by their frequent growing hollow) or by the Defects of the Gums, or their Sockets. Diſeaſes, and other Accidents, often pull them out in younger Heads, eſpecially Mercurial Salivations.

Veſſels.

The Veſſels which go to and from the Teeth, are Nerves from the fifth Pair, Arteries from the *Carotids*, and Veins which go to the external Jugular; all which run along the hollow of the *Maxilla inferior.*

Muſcles of the lower Jaw.

To this lower Jaw, which only is moveable, (the upper Jaw having none but what is common to the whole Head) belong five Pair of Muſcles.

Crotaphytes. Tab. xxiii, & xxiv.

The firſt of which is the *Crotaphytes*, or temporal. Its Fibres ſpring ſeverally from the Bones of the Forehead, the *Sinciput*, the *Sphenoides*, and temporal; which meeting, and as it were centring under the *Os Jugale*, from whence alſo this Muſcle receives ſome Fibres, they proceed to the *Proceſſus Coronæ*, into which they are inſerted, and draw the lower Jaw upwards. *Action.*

Maſſeter. Tab. ib.

The *Maſſeter* is partly continued from the former, and ſprings fleſhy and tendinous, from the firſt Bone of the upper Jaw, and backwards from the *Os Jugale:* Its Fibres decuſſating each other in acute Angles, deſcend to the inferior edge of the outſide of the lower Jaw, and aſſiſt the former in drawing up the Jaw. *Action.*

Biventer, *or* Digaſtricus. App. Tab. xxxix. Fig. iv.

The next is the Digaſtrick, ſo called from its having two *Venters*, or Bellies. It riſes fleſhy from a Furrow at the ſide of the *Proceſſus Maſtoides*, whence, in its Deſcent through the *Stylohyoideus*, and an annular Ligament of the *Os Hyoides*, it becomes tendinous. From this Bone ariſe ſome Fibres which joyn its ſecond Belly, where it grows again fleſhy, and returning upwards, is inſerted into the middle of the inferior part of the lower Jaw. *Action.* By this Contrivance, its middle Tendon, which paſſes through the circular Ligament of the *Os Hyoides*, is ſeated lower than either its Origination or Inſertion, and by that means it is enabled to draw the Jaw downwards, which otherwiſe it had been impoſſible for it to have done.

Pterygoideus internus. The *Pterygoideus internus* ariſes partly fleſhy, partly tendinous, from the *Proceſſus Pterygoides* of the *Os Sphenoides*, and is inſerted at the bottom of the lower Jaw, on its inſide, oppoſite to the *Maſſeter*. *Action.* Theſe Muſcles acting ſeverally, draw the Jaw to one ſide; but together, they aſſiſt the *Maſſeter* and *Crotaphytes* in the Action of Maſtication.

Pterygoideus externus. The *Pterygoideus externus* ariſes from the external part of the ſame *Proceſſus Pterygoides*, and from the ſuperior part of the *Os Sphenoides*, near its Commiſſure with the Bone of the Temple, and running backwards, is inſerted into the *Proceſſus Condyloides* of the lower Jaw. *Action.* This Muſcle draws the Jaw forward, and makes the lower Jaw ſhoot beyond the upper.

Quadratus genæ. Beſides theſe, which are proper to the lower Jaw, the *Quadratus Genæ*, which is a broad, ſquare Muſcle, lying under the Skin of the Neck, ariſes thin and membranous from the Spines of the *Vertebræ* of the Neck, and from the Skin of the ſuperior part of the *Cucullaris*, and pectoral Muſcle: From whence aſcending under the Skin of the Neck, it becomes fleſhy, and is inſerted partly into the *Os Hyoides*, and partly into the middle of the under edge of the lower Jaw, and has been already deſcrib'd under the Name of the *Subcutaneus*. *Book* III. *Chap.* xiii.

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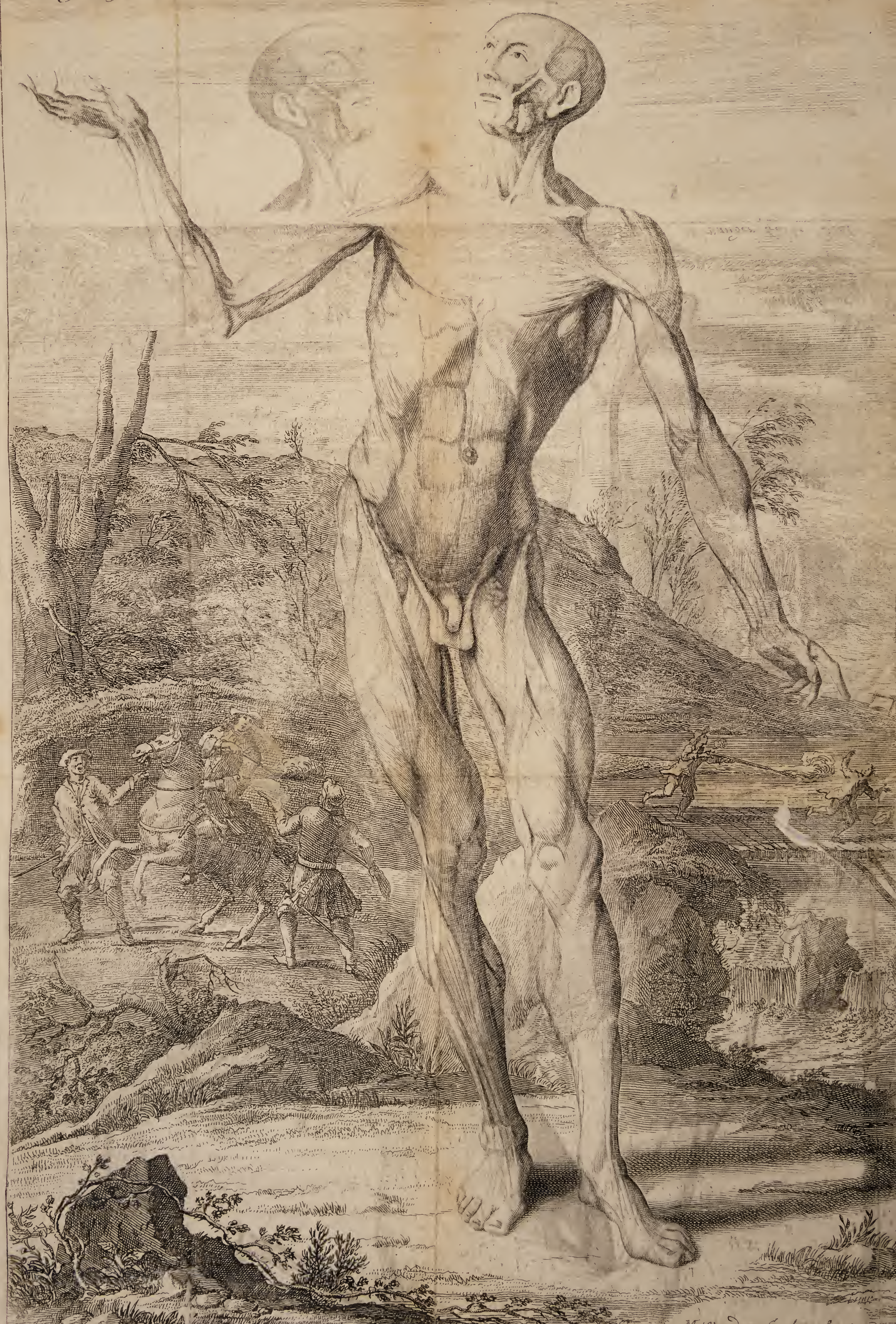
Tab: XXIII.



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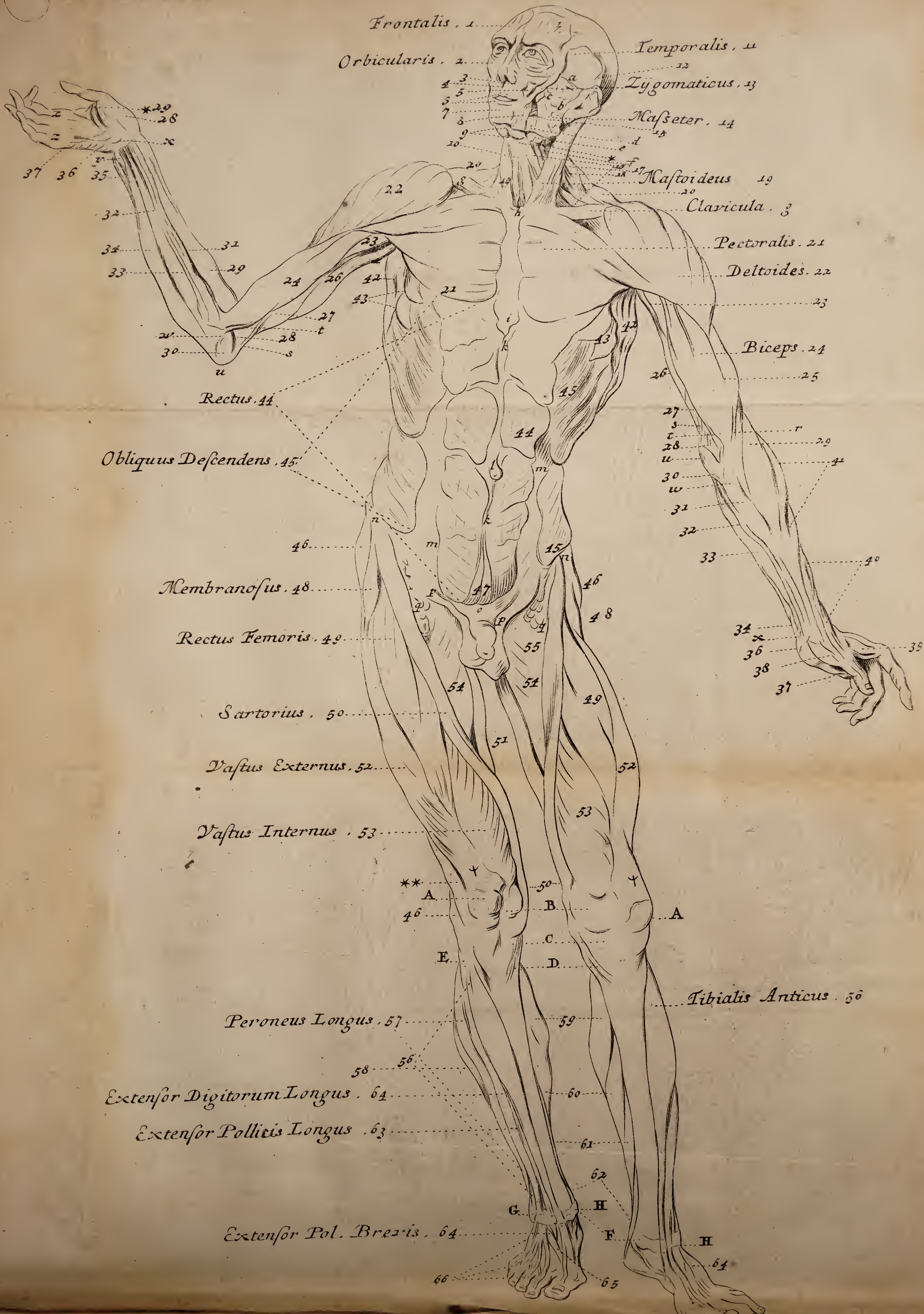
Tab: XXIII.


Frontalis . 1
Temporalis . 11
Orbicularis . 2
Zygomaticus . 13
Maſseter . 14
Maſtoideus 19
Clavicula . 8
Pectoralis . 21
Deltoides . 22
Biceps . 24
Rectus . 44
Obliquus Deſcendens . 45
Membranoſus . 48
Rectus Femoris . 49
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Peroneus Longus . 57
Extenſor Digitorum Longus . 64
Extenſor Pollicis Longus . 63
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T A B. XXIII.

1, THE *Muſculus Frontalis.*

2, The *Orbicularis Palpebrarum.*

3, The *Elevator Labii ſuperioris,* and *Dilatator Alæ Naſi.*

4, The *Elevator Labii ſuperioris proprius.*

5, The *Elevator Labiorum.*

6, The *Orbicularis, ſeu Sphincter Labiorum.*

7, *Depreſſor Labii inferioris proprius.*

8, *Depreſſor Labiorum communis.*

9, The two Extremities of the *Digaſtrici,* near their Inſertions to the lower Mandible.

10, The *Sternohyoideus.*

11, The *Temporalis.*

12, The *Elevator Auriculæ.*

13, The *Zygomaticus.*

14, The *Maſſeter.*

15, Part of the *Buccinator.*

16, The *Coracohyoideus.*

17, Part of the *Elevator Scapulæ.*

18, Part of the *Scaleni.*

19, The *Maſtoideus.*

a, The *Os Jugale.*

b, The *Parotid* Gland.

c, Its Salival Duct.

d, The lower Jaw-Bone bared.

e, The inferior Maxillar Gland.

*, Part of the *Os Hyoides.*

f, A conſiderable Branch of the *Carotid* Artery, *vid. App. Tab.* XXXIX. *Fig.* iv. not letter'd.

g, The *Clavicula.*

h, The upper part of the *Os Pectoris,* or *Sternum,* where the *Claviculæ* are articulated.

i, The *Cartilago Enſiformis* at the lower part of the *Sternum.*

k k, The *Linea Albà.*

l, The Navel.

m, The *Lineæ ſemilunaris,* or meeting of the Tendons of the two oblique Muſcles, before they paſs over the *Rectus.*

n, The Spine of the *Os Ilium.*

o, The *Os Pubis.*

p, The Proceſs of the *Peritoneum,* incloſing the ſpermatick Veſſels.

q, The *Glandula Inguinalis.*

r, The Trunk of a Nerve, marching by the *Muſculus Biceps,* which I have known wounded by an ignorant Blood-letter, in opening the middle Vein of the Arm.

s, The Trunk of a Nerve, paſſing immediately behind the internal Protuberance of the *Os Humeri,* by preſſing of which a great Pain is cauſed.

t, The Trunk of the Axillary Artery, deſcending under the *Faſcia Tendinoſa* to the Cubit, where it is ſometimes wounded by bold Blood-letters.

u, The internal Protuberance of the *Os Humeri*.

w, The *Faſcia Tendinoſa*.

x The *Ligamentum Annulare* of the *Carpus*.

y, The Extremity of the *Ulna* next the *Carpus*.

z z, The tendinous Expanſion of the *Palmaris* in the Palm.

Ψ Ψ, The Tendon of all the extending Muſcles of the *Tibia*, above the *Patella*.

A, The *Patella*.

* *, The Tendon of the *Muſculus communis Membranoſus*, near its Implantation to the *Fibula*.

B, The internal lower Protuberances of the Thigh-bones.

C, The ſuperior Appendages of the *Tibia*.

D, The Terminations of the Tendons of *Sartorius gracilis*, and *Seminervoſus*.

E, The upper *Appendix* of the *Fibula*.

F, The *Malleoli interni*, or lower Appendages of the *Tibiæ*.

G, The *Malleolus externus*, or lower *Appendix* of the *Fibula*.

H, The *Ligamentum tranſverſale pedis*.

N. B. If any of the ſame Parts are referr'd to by the like Characters in any of the ſucceeding Figures, let theſe be their Explication.

20, Part of the *Cucullaris*.

21, The *Pectoralis*.

22, The *Deltoides*.

23, Part of the *Coracobrachialis*.

24, The *Biceps*.

25, The *Brachiæus externus* in the left Arm.

26, Part of the *Gemellus*.

27, The *Brachiæus internus*.

28, The *Brachiæus externus* in the right Arm.

29, The *Supinator Radii longus*.

30, The *Pronator Radii Teres*.

31, *Flexor Carpi Radialis*.

32, *Palmaris longus*.

33, *Flexor ſecundi internodii Digitorum perforatus*.

34, *Flexor Carpi Ulnaris*.

35, Part of the *Extenſor Carpi Ulnaris*, in the right Arm.

36, *Palmaris brevis*.

37, *Abductor minimi Digiti*.

38, *Abductor pollicis*.

39, *Abductor indicis*.

*, 39, *Flexor ſecundi Oſſis pollicis*.

40, *Extenſores pollicis* of the left Arm, partly in ſight.

41, Parts of the *Radialis Extenſor* of the ſame Arm.

42, Part of the *Latiſſimus Dorſi*.

43, The *Serratus major Anticus*.

44, The *Rectus Abdominis*, under the two Tendons of the oblique Muſcles.

45, 45, The *Obliquus deſcendens*.

46, Part of the *Glutæus medius*, cover'd with the Tendon of *Glutæus magnus*.

47, The *Pyramidales*.

48, The *Membranoſus*.

49, The *Rectus Femoris*.

50, The *Sartorius*.

51, Part of the *Gracilis* in each Thigh.

52, The *Vaſtus externus*.

53, The *Vaſtus internus*.

54, The firſt deſcrib'd head of the *Triceps.*
55, The ſecond.
56, The *Tibialis Anticus.*
57, The *Peroneus primus.*
58, Part of the *Gaſtrocnemius internus*, or *Soleus.*
59, Parts of the *Gaſtrocnemii externi.*
63, Parts of the *Solei* on the inſide of the Legs.
61, Parts of the *Flexores Digitorum perforantes.*
62, Part of the *Tibialis poſticus* appears near the *Malleolus internus.*
63, The *Extenſor pollicis pedis longus.*
64, *Extenſor Digitorum longus.*
65, The *Extenſor pollicis brevis.*
66, The *Extenſor Digitorum brevis.*

CHAP. IV.

Of the BONES *and* MUSCLES *of the* NECK.

Vertebræ.

THE Bones of the Neck are call'd *Vertebræ*, and are in that part ordinarily ſeven only in Number; tho' Authors ſay, that ſome long neck'd Perſons have had eight.

Subſtance.

Apophyſes.

Diarthroſis.

Synchondroſis.

Ginglymus.

Each *Vertebra* conſiſts of a Body, the Subſtance of which is ſpongy or cavernous, having in the middle a large Perforation, thro' which the *Medulla Spinalis* paſſes, and ſeven *Apophyſes*, or Proceſſes. The fore-part of the Body is round, or convex; the hinder, from which ſpring the Proceſſes, ſomewhat depreſs'd or flattiſh. Their upper and lower ſides, by which they are connected to one another, are plain, and cover'd with a Cartilage. They are joyn'd to one another by a looſe Articulation, with a manifeſt Motion, with an intermediate Cartilage on the Surface of each Bone, and receive one another; the Head of the lower entring a ſmall Concavity in the lower part of the upper; except the firſt and ſecond of them.

Proceſſes.

They have all eight Proceſſes, except the firſt, which have but ſix; two ſuperior, two inferior, two tranſverſe, and two poſterior, which are peculiarly

Spine. culiarly nam'd the Spines; from which the whole Series of Bones, from the Head to the end of the *Os Sacrum*, conſiſting in all of thirty Bones, (whereof twenty four only belonging to the Neck, Back, and Loins, are ſtrictly to be call'd *Vertebræ*) is nam'd the Spine. The poſterior Proceſs is wanting in the firſt *Vertebra* of the Neck.

Atlas. App. Tab. xlix. Fig. vi. The firſt *Vertebra* is call'd *Atlas*; becauſe it ſuſtains and ſupports the Head, to which it is join'd by its aſcending oblique Proceſſes, which receive the Tubercle of the *Occiput*.

Epiſtrophus. Ib. Fig. vii. The ſecond is call'd *Epiſtrophus*; from the middle of which ariſes a Proceſs reſembling a Tooth, and therefore call'd *Dens*; which is inſerted into a *Sinus*, fenced with a Ligament within the great Perforation of the firſt *Vertebra*: Upon this the Head turns, as upon an *Axis*. The Superfice of this Proceſs is a little rough, upon the account of a Ligament which riſes from thence, and ties it to the *Occiput*. It is likewiſe ſurrounded by another Ligament, which keeps it from ſlipping out of its *Sinus*, or Socket, and compreſſing the Spinal Marrow, which would be a fatal Accident.

Axis. The third *Vertebra* of the Neck is call'd the *Axis*; a Name better ſuiting the Office of the former: The reſt of the *Vertebræ* have no peculiar Names.

Foramina. All the tranſverſe Proceſſes are perforated (which is peculiar to thoſe of the Neck) for the Paſſages of the Cervical Arteries and Veins, which paſs to and from the Brain. The Spines of the ſix lower are forked, and have ſmall Muſcles between them, call'd *Interſpinales Colli*.

Longus Colli. App. Tab. xl. Fig. iii. The firſt of the Muſcles of the Neck is the *Longus Colli*; which ariſes mainly fleſhy, tho' tendinous in a ſmall part of its Origin, from the fore-part of the five upper *Vertebræ* of the *Thorax*, and is inſerted into the fore-part of every *Vertebra* of the Neck.

Acti.n.

It ſhews plainly its Action to be to bend it forward. This, as moſt other Muſcles of the Neck, ſecondarily affect the Head in its Motion, as it ſtands and turns upon the Neck, and ſo is with them ſometimes reckon'd amongſt the Muſcles common to the Head.

Scaleni. Ibid.

The *Scaleni* are likewiſe by ſome accounted Muſcles of the Neck; but ſerving rather for the Motion of the Ribs, they ſhall have a place amongſt thoſe Muſcles, as *Fallopius* has put them.

Muſculus Spinalis Colli. Tab. ib. Fig. ii.

The *Spinalis Colli* ſprings from the five ſuperior tranſverſe Proceſſes of the *Thorax*, and inferior of the Neck. It creeps along the Spine, from which courſe it is call'd *Spinalis*, and becomes at laſt pretty full and fleſhy, at its Inſertion on the inferior Part of the ſecond *Vertebra* of the Neck laterally. This draws the Neck backwards.

Action.

Tranſverſalis Colli. Ibid.

Under this lies the *Tranſverſalis Colli*; which ariſes fleſhy from the Tranſverſe Proceſſes of the upper *Vertebra* of the *Thorax*, and is inſerted by a ſeveral Tendon, into every Tranſverſe Proceſs of the Neck, which it runs laterally backwards, ſerving to look over the Shoulder.

Action.

Interſpinales Colli.

Beſides theſe, proper to the Neck are five Pair of ſmall Muſcles; diſcovered by Mr. *Cowper*, and by him, from their Poſition, call'd *Muſculi Interſpinales.* They ariſe from each double Proceſs of the Spine of the Neck, and run from the upper, to the next below; into which they are inſerted. Theſe ſerve to approximate and draw together the *Vertebræ* of the Neck, and are more eſpecially proper to this Part, as having both Origin and Inſertion in it.

Action.

Beſides theſe, he has ſince obſerv'd others of the ſame Size and Figure, between the Tranſverſe Proceſſes of the *Vertebræ* of the Neck;

which he calls *Intertranſverſales Colli. Vid. Phil. Tranſact.* Vol. 21. p. 132.

CHAP. V.

Of the BONES *of the* BACK, *and other parts of the* THORAX, *and their* MUSCLES.

Vertebræ. THE *Vertebræ* of the Back are in Number twelve, and have the ſame Figure, Proceſſes, Articulations, Cartilages, Perforations, for the *Medulla Spinalis*, with the five lower of the Neck; except that the Body of the *Vertebra* is here ſomewhat larger, and the Tranſverſe Proceſſes not perforated, as they are in the Neck, for the Paſſage of the Cervical Arteries; and have on each ſide of the Body of the *Vertebra*, a ſmall Impreſſion or *Sinus*, for the reception of the round Head of each Rib: And in the tranſverſe Proceſs another very ſmall one, which receives the Prominence of the Rib near that Extremity. Sinus.

Sternum. The fore-part of the *Thorax*, call'd the *Sternum*, is cover'd with a broad ſpongy Bone, partly Cartilaginous; which for the firſt ſeven or eight Years of our Lives, do remain ſuch, and conſiſts of eight ſeveral Bones, or rather Cartilages, which ſlowly and in length of time become Oſſeous, and unite, and ſeldom have, in Adults, above three diſtinguiſhable Bones.

Sinus. The uppermoſt of theſe is the largeſt and thickeſt, eſpecially in its upper Part; and has on each ſide two *Sinus*, one for the Head of the Clavicle (of which more afterwards in its proper place) and another ſomewhat lower, for the Cartilaginous end of the firſt Rib.

Sinus. The ſecond, which is longer than the former, is likewiſe thinner, and has on each ſide four or five *Sinus*, for the Reception of ſo many of the Ribs.

The third and laſt is the leaſt of them, and receiving into its *Sinus*, on each ſide one or two of the true Ribs, grows narrow afterwards, and ends in a Cartilaginous point, which is call'd the *Cartilago Zyphoides*, or *Enſiformis*, from its Figure, which is imagin'd to reſemble the Point of a Sword. This Point is ſometimes forked, and then it is call'd *Furcilla*. Zyphoides. Furcilla.

On the outſide of the *Sternum* is a pretty large Depreſſion, or ſinking in about the middle, which is call'd *Scrobiculus cordis*. Scrobiculus cordis.

Its outſide is generally rough, for the better hold of the Muſcles, which either ſpring from, or are inſerted into it: The inſide is ſmooth.

The Ribs are in Number twelve on each ſide, ſeven genuine, and five ſpurious. They are of an arched Figure, making an imperfect Segment of a Circle, more incurvated towards their Articulation with the *Vertebræ* (which is *per Ginglymum Arthrodialem*) where they are rounder and harder than at the other Extremity towards the *Sternum*, which is leſs incurvated, much thinner, broader, more ſpongy, and joyn'd *per Harmoniam* with a Cartilage intermediate, which in Age often becomes Oſſeous. *Ribs.* *Figure.*

They are faſtned likewiſe to the *Vertebræ*, *per Syneuroſin*, by means of their Ligaments. *Connexion.*

On the inſide of the true Ribs, except the Inferior, and ſometimes the next to it, runs a pretty deep *Sinus*, reaching from the end towards the Spine (where it is deepeſt) almoſt to its juncture with the Cartilage; which receives the Intercoſtal Arteries, Veins and Nerves, and lies juſt under the upper edge of each Rib. Sinus.

The five lower Pair of Ribs are called Spurious, and are ſhorter and more cartilaginous than the reſt; of which only the firſt has any Connexion Nothæ.

Connexion. xion with the *Sternum:* The reſt growing ſtill ſhorter every Pair than the other, are join'd by their Cartilages to the lower ſide of that next above them: To the *Vertebræ* of the Back, they are connected only by a ſimple Proceſs.

Motion. All theſe Ribs, together with the *Sternum*, are rais'd by means of the Reſpiratory Muſcles, in the Action of Inſpiration; by which means, and the Deſcent of the Diaphragm in that Action, the Cavity of the *Thorax* is enlarg'd, for the more commodious Expanſion of the Lungs.

Muſcles of the Thorax. The Muſcles of the *Thorax* ſerve for two ſeveral Motions; either to move the whole Cavity together upon the *Vertebræ*, as in bending and turning the Body; or the *Sternum* and Ribs only, as in Reſpiration; by which means its Cavity is alternately dilated and compreſſed, which occaſion Inſpiration and Expiration.

Diviſion. The Muſcles, which perform theſe Actions, are divided into Common and Proper.

Common. The Common are thoſe, which though ſerving for the Motion of theſe Parts, have their Originations out of the Limits of the *Thorax.* *Proper.* The proper are ſuch as both ariſe and terminate within the Bounds of the *Thorax.*

Subclavius. Tab. xxv. 9. 9. Among the Common may be reckon'd, firſt, the *Subclavius*; which ariſes fleſhy from the inferior part of one half of the *Clavicula*, and is inſerted into the upper part of the firſt Rib, which *Action.* it helps to elevate.

Serratus Major Anticus. Ib. 16. Next, the *Serratus Major Anticus*; which ariſes from the whole *Baſis* of the *Scapula*, and has a ſeveral Inſertion into every one of the true Ribs, and the firſt of the Spurious: Upon the three loweſt of which, it is indented with the Teeth of the *Obliquus Deſcendens* of the *Abdomen*, from whence it is call'd *Serratus.*

Seratus Minor Anticus. Ib. 10. The *Serratus Minor Anticus*, ſprings from the *Proceſſus Coracoides* of the *Scapula*, and deſcending

ing obliquely, ſpreads it ſelf upon the ſecond, third, fourth and fifth Ribs, into each of which it is inſerted. This Muſcle has been generally reckoned by Anatomiſts amongſt thoſe of the *Scapula*: But its Inſertions into theſe Ribs plainly juſtify Mr. *Cowper*'s Concluſion, that it ſerves to draw theſe Ribs upwards; which uſe gives it a place here.

Action.

Scaleni. 1. Tab. xxv. 5.

Of the *Scaleni* there are three Pair; the firſt of which ſprings fleſhy from the tranſverſe Proceſſes of the ſecond, third and fourth *Vertebræ* of the Neck; where deſcending laterally, it is inſerted into the firſt Rib, which it helps to draw upwards.

Action.

2.

The ſecond *Scalenus* ariſes from the ſame Proceſſes, as likewiſe from thoſe of the fifth *Vertebra* of the Neck, and is inſerted into the ſecond Rib, and ſometimes into the third. Between this Muſcle and the former, run the Axillary Nerves.

3.

The third ariſes from the ſame Proceſſes with the former, and from thoſe of the ſixth *Vertebra* of the Neck, and is inſerted into the firſt Rib. All theſe draw the Ribs upwards; and are aſſiſted by the *Serrati ſuperiores poſtici*, and Intercoſtals of both kinds, which are eſteem'd proper Muſcles of the *Thorax*.

Serratus ſuperior poſticus. Tab. xxvii.

The *Serratus ſuperior poſticus*, lies immediately under the *Rhomboides*. It ariſes with a thin Tendon, from the lower Spine of the two laſt *Vertebræ* of the Neck, and from thoſe of the three upper of the *Thorax*, and running obliquely over the *Splenius* and *Dorſi Longiſſimus*, is inſerted into the ſecond, third and fourth Ribs, at their Curvature, by ſo many ſeveral indented Inſertions. Theſe help to draw the Ribs upwards.

Action.

Intercoſtals. Tab. xxiv.

The Intercoſtals, of both kinds, are in number Forty four, and are plac'd in the Intervals of the Ribs, on each ſide eleven external, and eleven internal, which connect and draw together the Ribs. The Fibres of theſe Muſcles run in an Order contrary to each other; which has made moſt Anatomiſts imagine, that they antagoniz'd one another, fancying that the external drew upwards, and the internal downwards.

Action. This erroneous Opinion was firſt refuted ſeverally by the Learned *Steno*, and our ingenious Dr. *Mayow*: Whoſe Arguments, however convincing, have, nevertheleſs, fail'd of Succeſs, over the Prejudices of many later Writers; who calling the upper part of the internal Intercoſtals, their Origin, and the lower their Inſertion, will rightly enough have them to draw upwards; but believing that the internal, upon the ſcore of the contrary courſe of their Fibres, had their Origination and Inſertion juſt the Reverſe to the former, think they muſt needs act contrary; not conſidering, that which ſoever part of theſe ſhort Muſcles, they make the Head or Tail of them, the more moveable Point muſt neceſſarily be drawn towards the leſs moveable (which is the upper) without any regard to their Denominations: And that if theſe Muſcles had oppoſite Motions, when the external were contracted, the internal muſt be flaccid and corrugated, contrary to the condition of all other Muſcles, which are moſt extended in length, when over-power'd by their Antagoniſts. However, *Diemerbrook* is ſo confident of having demonſtrated the Abſurdity of Dr. *Mayow*'s Opinion, that divers Anatomiſts ſtill retain the old Diviſion, and number the Internal among the Depreſſors of the Ribs.

Fibres external. The Fibres of the external ſpring from the lower edge of the upper Rib, and running obliquely towards the *Sternum*, end in the outſide of the upper edge of the Rib next below. Thoſe of the internal, riſe from the inſide of the lower *Internal.* edge of the upper Rib, and running obliquely towards the *Vertebræ*, are inſerted into the inſide of the upper edge of the next Rib, decuſſating each other in right Angles, without any neceſſity of a contrary Action.

All theſe common Muſcles co-operate with the proper ones of the Ribs, in drawing them upwards, and though their united Force may ſeem to be infinitely greater than the proper weight of the Ribs would require, yet when we conſider the Weight of the Atmoſphere, which antagonizes, we ſhall find nothing ſuperfluous in this ample Proviſion; even though the Muſcles which draw the contrary way are inconſiderable, compar'd with them: For though the ſeveral Inſertions of theſe Muſcles, may make them look as if they were deſtin'd to move different Parts and Ribs diſtinctly; yet the continuity of all the Ribs with the *Sternum*, obliges all theſe Muſcles to act together, and to lift up the whole *Compages* of the *Sternum* and Ribs at once.

The common Muſcles, which ſerve for con- Contractores. tracting the Cavity of the *Thorax*, by pulling down the Ribs, are the *Sacrolumbares*, and the *Diaphragma*; to which may be added the Abdominal Muſcles; which being fix'd partly to the lower Ribs and *Sternum*, muſt neceſſarily in their Action draw downwards. But of theſe laſt we have already given the Deſcriptions elſewhere.

The *Sacrolumbaris* hath its Origination in com- Sacrolumbaris. Tab. xxvii. mon with the *Dorſi Longiſſimus*; and externally ariſes tendinous, from the Poſterior part of the Spine of the *Os Ilium*, the ſuperior Spine of the *Sacrum*, and from all the Spines of the *Vertebræ* of the Loins. Internally it ariſes fleſhy; not only from thoſe Parts, but from the tranſverſe Pro-

ceſſes

ceſſes of the Lumbal *Vertebræ*; from whence to the loweſt Rib, it ſeems to be form'd of two *Venters:* Where again, and upon the reſt of the Ribs, it is diſtributed into a great number of Tendons (and, as *Steno* will have it, *Venters* too) variouſly and irregularly diſtributed to every Rib; where, at their Inſertions, they are met by other fleſhy Fibres, coming from the third, fourth, fifth and ſixth *Vertebra* of the Neck, which are juſtly enough, by *Diemerbrook*, eſteemed another pair of Muſcles, Antagoniſts to theſe, and call'd by him, *Cervicales deſcendentes*. Theſe ſhould have been numbred amongſt the Muſcles that elevate the Ribs, but that they are generally by Authors reckon'd (though improperly) as a production and part of the *Sacrolumbus*.

Cervicales deſcendentes.

Diaphragm. The Diaphragm is a common Muſcle belonging in part to this Region of the Body. Both in Structure and Uſe hath been already ſpoken of, therefore we ſhall take no farther notice of it here.

Proper. The proper Muſcles employ'd in contracting the Cavity of the *Thorax*, are firſt,

Serratus poſticus inferior. Tab. xxvii.

The *Serratus poſticus inferior*, ariſes from the Spines of three of the lower *Vertebræ* of the *Thorax*, and two upper of the Loins. Both its Extremities are tendinous, and its Belly fleſhy, and ends with an indented Termination in the four lower ſpurious Ribs.

Triangularis.

The *Triangularis*, which has ſometimes the appearance of three or four diſtinct Muſcles on each ſide, ariſes from the inſide of the *Sternum*, and is implanted into the Cartilages, which joyn the four loweſt true Ribs to the *Sternum*. The *Action.* Action of this Muſcle is very obſcure, ſince they have both their Origination and Inſertion at a part not moveable, but together; towards which it is not eaſily conceivable, how they ſhould contribute.

A Conjecture about their uſe.

Perhaps their uſe is not really for Motion; which I am the rather apt to ſuſpect, becauſe they ſeem not to be affected by any Antagoniſts, but to be in a perpetual State of Tenſion, by which they may poſſibly conduce towards the forming of the neceſſary Incurvation of the *Sternum*; and by their over-tenſion in young Children, whilſt the Cartilages are ſoft, may occaſion that Morbid Acumination of the *Sternum*, which is obſerv'd in Rickety Children. The ſtrength of this Conjecture might be much confirmed or abated, if it were found, that in young Children theſe Muſcles were proportionably larger than in Adults. But of this I have made no Obſervation, nor do I find any Authors that have, and therefore leave it to farther Enquiry.

T A B. XXIV.

A Side View of the External Muſcles, after the *Obliquus Deſcendens* is remov'd.

1, The *Muſculus Frontalis.*

2, The *Orbicularis Palpebrarum.*

o, *Elevator Alæ Naſi.*

3, The *Elevator Labii ſuperioris.* & *Dilatator Alæ Naſi.*

4, *Elevator Labiorum communis.*

5, *Elevator Labii ſuperioris proprius.*

6. *Depreſſor Labii inferioris proprius.*

7, *Depreſſor Labiorum communis.*

8, *Sphincter Labiorum.*

9, *Zygomaticus.*

10, The *Buccinator.*

11, The *Maſſeter.*

12, *Temporalis.*

13, *Elevator Auriculæ.*

14, *Maſtoideus.*

15, *Elevator Scapulæ.*

16, Part of the *Scalenus* and *Subſcapularis. Vid. Tab.* 25. *N.* 5.

17, Part of the *Coracohyoides.*

18, Part of the *Cucullaris.*

19, Part of the *Digaſtricus* of the right Side, near its Termination.

20, The *Sternohyoides.*

21, The *Deltoides.*

22, The *Pectoralis.*

23, The *Coracobrachialis* partly ſeen.

24, The *Biceps Cubiti.*

25, The *Brachiæus internus.*

26, Parts of the *Gemellus* in both the Arms.

27, The *Pronator Radii teres*, in the left Arm, running

ning under the tendinous Expanſion of the *Biceps*.

28, The *Supinator Radii longus*.

29, The *Extenſor Carpi radialis*.

30, The Extenders of the Thumb.

31, The *Adductor Pollicis*.

32, The *Abductor indicis*.

33, Part of the *Flexor ſecundi Oſſis pollicis*.

34, The *Radialis Flexor*.

35, Part of the *Flexor Digitorum Perforatus*.

36, The *Abductor pollicis* in the left Hand.

36, In the right Hand the *Extenſor Digitorum communis*.

37, *Minimi Digiti extenſor*.

38, The *Ulnaris extenſor Carpi*.

39, The *Ulnaris flexor Carpi*.

40, Part of the *Teres major*.

41, Part of the *Latiſſimus Dorſi*.

42, Part of the *Serratus major Anticus*.

43, The *Intercoſtales externi*.

44, The *Obliquus Aſcendens in ſitu*, with its Tendon running over the *Rectus* 47, to the *Linea Alba* h.

45, Part of the *Obliquus Deſcendens*.

46, The *Pyramidalis*.

47, The *Rectus Abdominis*.

48, The *Muſculus Membranoſus*.

** Part of its Membranous Expanſion, which is implanted on the upper *Appendix* of the *Fibula* †.

49, Parts of the *Sartorius* on both Thighs.

50, Part of the *Glutæus Medius*, under the tendinous Production of the *Glutæus magnus*.

51, Part of the *Glutæus magnus*.

52, The *Rectus femoris* in both Thighs.

53, Part of the *Triceps*.

54, Part of the *Gracilis*.

55, The *Vaſtus internus*, part of which is ſeen in the left Thigh.

60, The *Vaſtus externus*.

61, Part of the *Biceps femoris*, near its Termination.

62, The *Tibialis Anticus*, in the left Leg, *in ſitu*; in the right Leg its Tendon only is expreſt near its Termination.

93, The *Gaſtrocnemius internus* in both Legs.

64, The *Extenſor Digitorum pedis longus*.

65, The *Peronæus longus*:

66, Part of the *Gaſtrocnemius externus* of the right Leg.

67, Parts of the *Soleus* in both Legs.

68, The long Tendon of the *Muſculus Plantaris*.

69, Part of the *Tibialis poſticus*, as it paſſes behind the *Malleolus internus*.

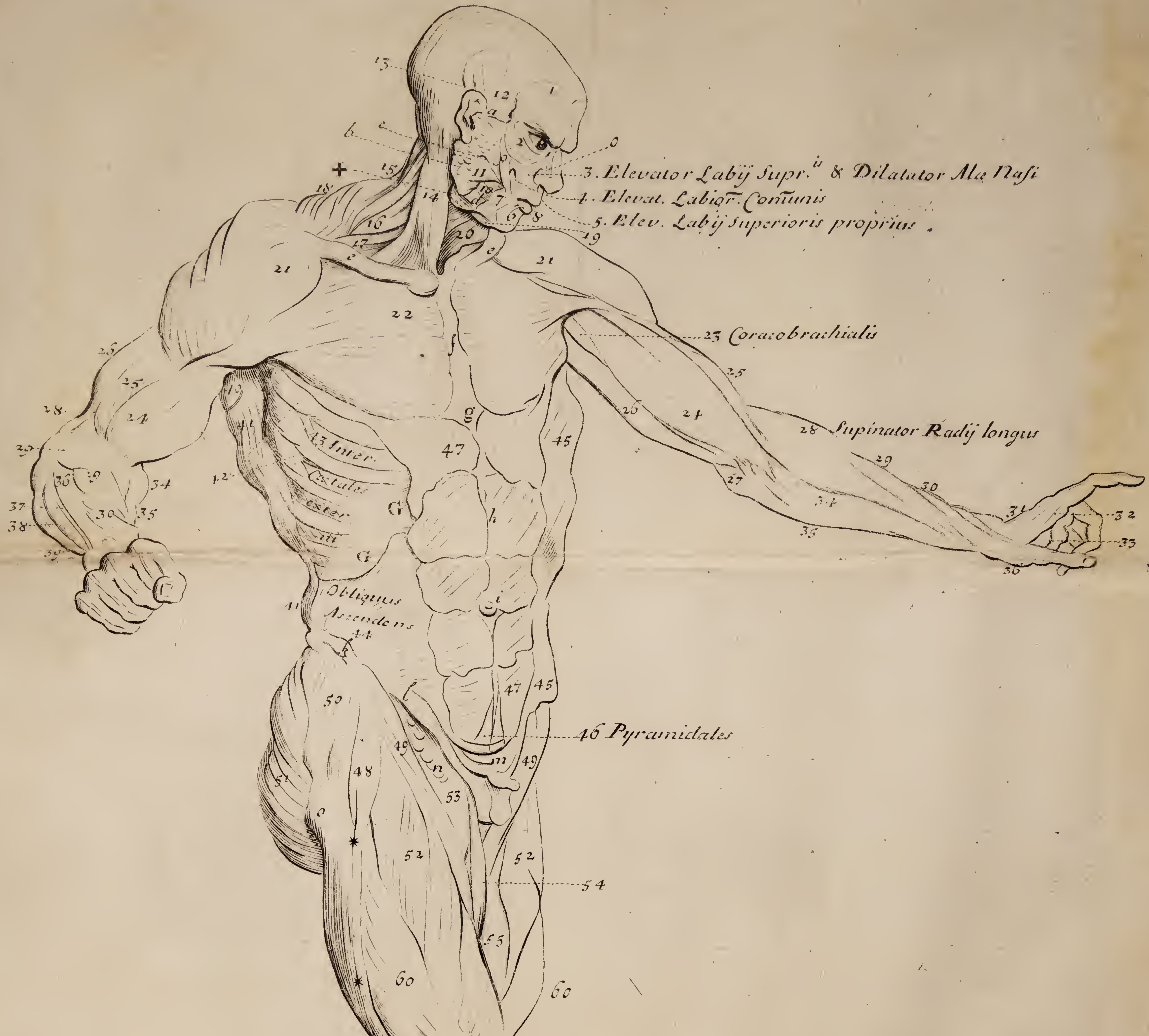
70, Part of the *Flexor Digitorum pedis perforans*.

71, *Extenſor pollicis pedis longus*, to be ſeen near its Termination only in the left Foot.

72, The *Abductor pollicis pedis*.

73, *Extenſor Digitorum pedis brevis*.

74, *Abductor minimi digiti pedis*. 75 Ex-


3. Elevator Labij Supr.ii & Dilatator Alæ Naſi
4. Elevat. Labior. Comunis
5. Elev. Labij Superioris proprius.
23 Coracobrachialis
28 Supinator Radij longus
43 Inter. Costales exter.
Obliquus Ascendens
46 Pyramidales
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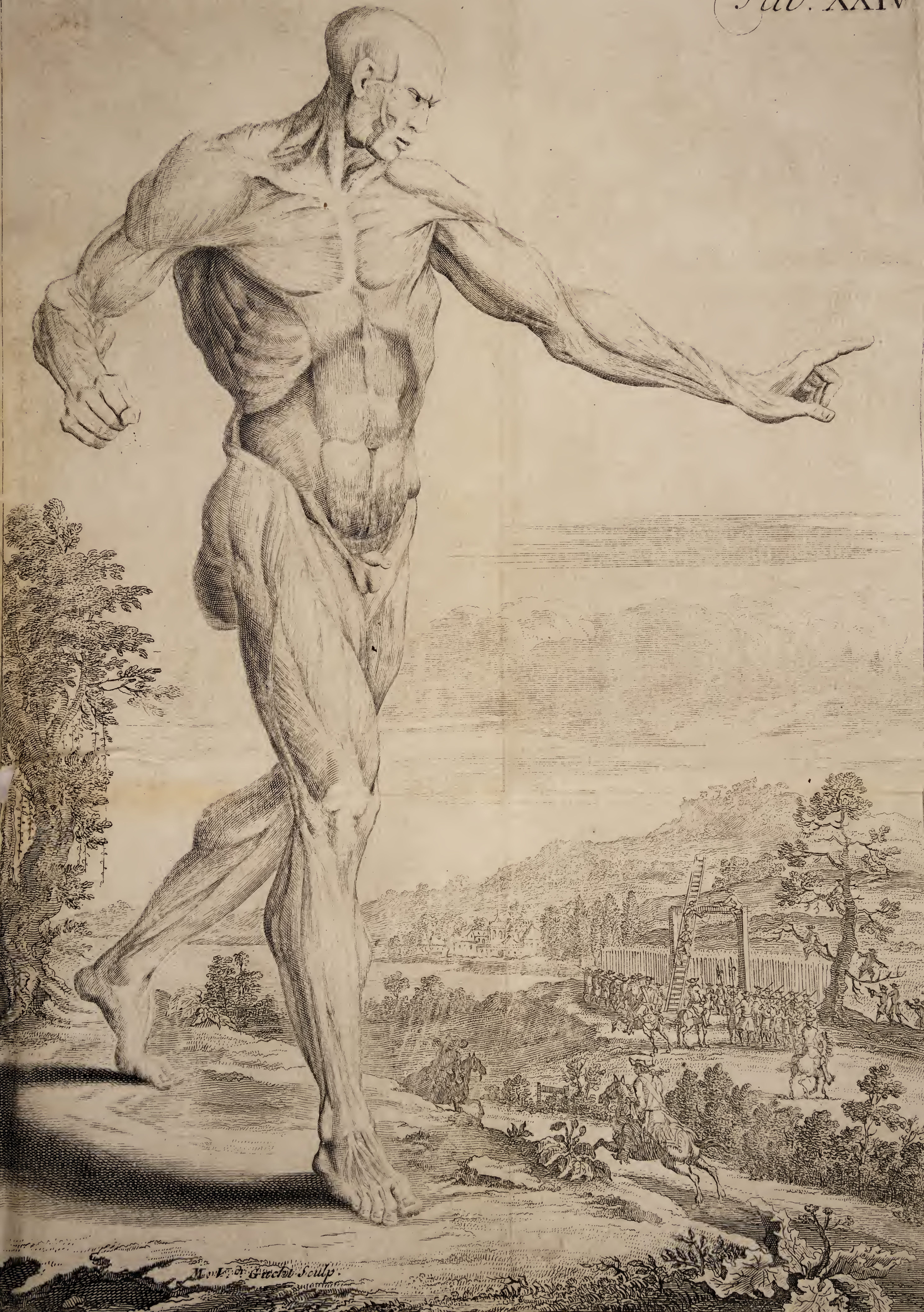
Tab: XXIV



75, *Extenſor Pollicis brevis.*
76, Part of the *Peronæus brevis*; the reſt of it lying under the *Longus*, 65.
a, The *Os Jugale.*
b, The *Parotid* Gland.
c, Its *Ductus Salivalis.*
d, The lower Jaw-bone bared.
✠ Part of the Inferior Maxillary Gland ſeen.
ee, The *Claviculæ.*
f, The *Sternum.*
GG, The Cartilaginous endings of the Ribs, below the *Sternum.*
g, The *Cartilago Enſiformis.*
h, The *Linea Alba.*
i, The Navel.
k, The Spine of the *Os Ilium* bared, by removing the *Muſculus Obliquus Deſcendens.*
l, The Proceſs of the *Peritonæum*, incloſing the Spermatick Veſſels, as it paſſes thro' the *Muſculus Obliquus Aſcendens*, to the *Teſtes.*
m, The *Os Pubis.*
n, The *Glandula Inguinalis.*
o, The great *Trochanter*, under the Tendinous Expanſion of the *Glutæus magnus & membranoſus.*
p, The *Patella.*
q, The lower *Appendix* of the *Os Femoris.*
r, The *Tibia.*
s, The *Malleolus internus.*
t, The *Malleolus externus.*
u, The *Ligamentum tranſverſale Pedis.*

CHAP. VI.

Of the CLAVICLES, SHOULDER-BLADES, BONES *of the* SHOULDERS, ARMS, HANDS *and* FINGERS, *with their* MUSCLES.

ON the outſide of the *Thorax*, beſides thoſe which conſtitute the Cavity of it, appear four Bones; two before, and two behind.

Claviculæ. Tab. xxi & xxii.

Thoſe before are two ſmall Bones, ſituated at the bottom of the Neck, on each ſide; in length about half a Foot, and about the thickneſs of the lower part of a Man's Finger; a little bent towards each end different ways, ſomewhat like the Letter S. Their inner Subſtance is ſpongy, which renders them very brittle, and eaſy to be broken, and again diſpoſes them as eaſily to coaleſce upon ſetting, and without any Manual Operation, they will frequently do ſo in Children.

Subſtance.

Connexion. They are joyn'd to the *Acromium* of the *Scapula*, by a flat thick Head, *per Synchondroſin*; and on the fore-part by a round Head, *per Arthrodiam*, to a *Sinus* on each ſide of the upper part of the *Sternum.*

Uſe. It ſerves to fix the Shoulder-Blade, ſo as to keep it from ſlipping too forwards upon the *Thorax* in Men, and thoſe Animals which uſe their Fore-Legs or Hands, as Monkies, Squirrels, *&c.* In hoofed Animals, who uſe their Fore-Legs for nothing but to tread upon, the Clavicles are very ſmall; being under a Neceſſity of bringing their Fore-Legs very near each other in walking, *&c.*

Scapulæ. Tab. xxii. The *Scapulæ*, or *Omoplatæ*, in *Engliſh* the Shoulder-blades, are two large broad Bones, of the Figure of an irregular Triangle of unequal ſides, ſituated on each ſide of the upper and back part of the *Thorax*; of a pretty ſolid firm Con-*Subſtance.*texture, tho' very thin in ſome Places. The upper, or outſide of it is ſomewhat Convex; the inner, a little concave: The Edges, which are Coſtæ. pretty thick, are call'd the *Coſtæ*; and along the middle of the outſide, lengthways, runs a large long Proceſs, which is call'd the Spine; betwixt the bottom of which, and the *Coſtæ*, lies the thin *Spine.* part of the Bone. The end of the Spine, which receives the Extremity of the *Clavicula*, is called Acromium. *Acromium.* The ſecond, which is ſomewhat lower, is ſhort and ſharp, and, from a fancy'd Coracoides. ſimilitude to a Crow's Bill, is called *Coracoides.* The third, which makes the Head of this Bone, has in it a pretty large, but ſhallow round *Sinus*, Cervix. lin'd with a Cartilage, which receives the Head of the *Os Humeri.*

Uſe. It ſerves to receive the Heads of the *Claviculæ* and *Humerus*, and to give riſe to the Muſcles which move the Shoulder.

Muſcles. There are four Pair of Muſcles ordinarily aſſign'd to the *Scapula*; of which the firſt is the

Serratus minor Anticus. Tab. xxv.

Serratus minor Anticus: Which having its other Extremities upon the Ribs, which are more eaſily moveable than the *Scapula*, has been deſcrib'd amongſt the Elevators of the *Thorax*.

Cucullaris. Tab.xxvi.

More properly to be reckon'd three.

Action.

The next is the *Cucullaris*; ſo call'd from the reſemblance of a Monk's Cowl; or *Trapezius*, from the geometrical Figure call'd *Trapezium*, to which, another way conſider'd, it bears a Similitude. This Muſcle might more juſtly be reckon'd three, as well upon the ſcore of the various Origination of its Fibres, as from their different Actions. The upper Order of Fibres (or Muſcle) ſprings from the *Os Occipitis*; the ſecond from the Spine of all the *Vertebræ* of the Neck; and the third from the Spines of the eight upper *Vertebræ* of the *Thorax*, or Back, and are inſerted into the Spine *Acromium*, and *Baſis* of the *Scapula*, and to part of the *Claviculæ*. From the different Diſpoſitions of theſe Fibres, the *Scapula* is drawn different ways; the firſt pulling obliquely upwards; the laſt, according to their ſituation, obliquely downwards; and the middle, backwards. When they act all three together, they are ſaid to draw backwards only; that is, in truth, the two Extremes antagonizing; the middle is only at liberty, and does really act.

Rhomboides. App. Tab. xlvi. & xli.

Action.

Under this lies the *Rhomboides*; ſo call'd from its Figure, which ariſes from the two inferior Spines of the *Vertebræ* of the Neck, and the four firſt of the *Thorax*; whence deſcending obliquely, it is inſerted into the whole length of the *Baſis*, or lower edge of the *Scapula*, which it draws backwards, and a little upwards.

Levator Scapulæ. Tab.xxvii

The third, (or, according to the reckoning of ſome, the fourth) is the *Levator Scapulæ*; call'd alſo *Muſculus Patientiæ*, from the Action of ſhrugging up the Shoulders in forc'd Submiſſions. This ariſes, by ſeparate Originations, from the tranſverſe Proceſſes of the ſecond, third, fourth, and fifth *Vertebra* of the Neck, and is inſerted into the upper Angle of the *Scapula*, which it pulls backwards.

Action. Os Humeri. Tab. xxi & xxii. The upper Bone of the Arm, which is by ſome call'd *Humerus*, and *Os Humeri*, reaches from the Shoulder, or ſhallow Socket in the Neck of the *Scapula*, to the upper end of the *Cubitus* at the Elbow. It is a large, long, round, fiſtulated Bone, of a pretty hard, compact Subſtance; and its inward Cavity, which contains the Marrow, is pretty long and large. At the upper end *Head.* it has a large round Head, which is cover'd with a very ſmooth Cartilage, which is receiv'd into the Cavity of the *Scapula*, and makes a Juncture *per Arthrodiam.* This Head of the Bone being much larger than the Socket into which it is receiv'd, the Part extant is ſtrictly embraced by a Ligament, one edge of which is faſtned to the Margin of the Cartilaginous Socket of the *Scapula*, the other to the lower part of the Head of this Bone; thereby uniting them firmly together, yet ſo as to leave the Motion the freeſt of all the Articulations of the Body, and therefore liable to diſlocations.

Lower end. At the lower end it has two Proceſſes, cover'd each with a Cartilage: One external, which receives the Extremity of the *Radius*, which is the leſſer of the two: The other internal, which being larger, receives the Head of the *Cubitus*. On the outſide of each of theſe Proceſſes there is a ſmall Tubercle, or Eminence, (as it were a little Proceſs budding out of a greater) to which are connected the Ligaments and Heads of the Muſcles, which move the *Carpus* and Fingers; of Sinus. which anon. In this Bone are three *Sinus:* One on the fore-ſide of the larger Proceſs, which receives the Fore-Proceſs of the *Cubitus:* Another on the back-part, which receives the Hinder-

Proceſs of the *Cubitus*, call'd *Olecranum:* And a third, a ſmall ſemilunar one, between the two Proceſſes, anſwering to the Eminence of the *Sinus* of the *Cubitus*.

Muſcles.

The later Anatomiſts are generally agreed in allowing to the Motion of this Bone five Pair of Muſcles, and five different ſorts of Motion; upwards, downwards, forwards, backwards, and rotatory.

Upwards.

The Arm is moved upwards by the *Deltoides*, *Supraſpinatus*, and *Coracobrachialis*.

Deltoides. Tab. xxiii, xxiv, xxvi

The *Deltoides*; ſo call'd from the *Greek* Δ, which it reſembles, is a large ſtrong Muſcle, ariſing from the middle of the Clavicle, the *Acromium*, and the whole length of the Spine of the *Scapula*; and is inſerted into the middle of the *Os Humeri*, on the inner ſide. *Steno* makes twelve diſtinct Muſcles, which, according to the courſe of their ſeveral Fibres, alter and compound the Motion of this Bone.

Vid. App. Tab. xlv. Fig. v.

Supraſpinatus. Tab. xxvii.

The *Supraſpinatus* has its Name from its fleſhy Origination, at the upper end of the *Baſis* of the *Scapula* above the Spine, to the upper part of which it is likewiſe connected, and to the ſuperior Rib of the *Scapula*; whence marching along the upper *Interſcapulium* (or thin part of the *Scapula*, between the upper *Coſta* and Spine) which it fills, it paſſes under the *Acromium* and Articulation of the *Humerus*, and embraces with its Tendon the Neck of that Bone.

Coracoidæus. Tab. xxv.

The *Coracobrachialis* ariſes partly fleſhy, partly tendinous, from the *Proceſſus Coracoides* of the *Scapula*, and paſſing over the Joint of the *Humerus*, is inſerted into the middle of the inner part of the Bone, which therefore it draws ſomewhat obliquely outwards, as well as upwards.

Downwards.

The Muſcles drawing downwards, are *Teres*, or *Rotundus major*, and the *Latiſſimus Dorſi*.

The

Teres *or* Rotundus major. Tab.xxvi, xxvii.

The *Teres major* ariſes from the lower Angle of the *Baſis* of the *Scapula*, and aſcending obliquely upwards, in a round ſmooth Body, under the Head of the *Longus*, is inſerted with a ſhort flat Tendon into the Neck of the *Os Humeri*, cloſe by the following; which is the

Latiſſimus dorſi. Tab.xxvi.

Latiſſimus Dorſi, and ariſes thin, broad, and tendinous, from the ſeven lower *Vertebræ* of the *Thorax*, from all thoſe of the Loyns, and the ſuperior of the *Os Sacrum*, and the poſterior part of the Spine of the *Os Ilium*. In its Paſſage over the *Longiſſimus Dorſi*, *Sacrolumbus*, and the incurvate part of the Ribs, it begins to grow thick and fleſhy, by means of ſeveral *Faſciculi* of Fibres which it receives from the Ribs: But its Body is again extenuated in its Paſſage towards the *Axilla*, over the lower Angle of the *Scapula*, and is at laſt inſerted into the *Os Humeri*, juſt by the *Teres major*, with a broad, ſtrong Tendon. This Muſcle is by ſome call'd *Aniſcalptor*; a Name which ſufficiently implies its Action downwards and backwards.

Aniſcalptor.

Pectoralis *Forwards.* Tab.xxiii, xxiv.

The *Pectoralis*, which is the only Muſcle that properly moves the Arm forwards, ariſes broad and fleſhy, with a ſemicircular Origination, from part of the Clavicle, *Sternum*, Cartilages of the ſix ſuperior Ribs, and bony part of the ſeventh, and from ſome of the upper of the ſpurious Ribs. Thoſe Fibres which ſpring from theſe lower Parts, running acroſs, and decuſſating thoſe which ſpring from the upper, make together a Body of a Muſcle, which covers almoſt all the fore-parts of the *Thorax*, and is at laſt inſerted by a thick, ſhort, ſtrong Tendon, into the upper and inner part of the *Humerus*, between the *Biceps* and *Deltoides*: The lower Fibres making the upper part, and the upper the lower part of the Tendon. This draws the Arm forwards.

Infraſpinatus. Tab. xxvi, xxvii.

The *Infraſpinatus* ariſes from the inferior parts of the *Baſis*, Spine, and under *Coſta* of the *Scapula*, and filling the lower *Interſcapulium*, paſſes on between the Spine and *Teres minor* in a triangular Form, and growing tendinous at the Cone, is inſerted into the Head of the *Humerus*, and draws directly backwards.

Tranſverſalis. Tab. Ib.

The next is the *Tranſverſalis*; call'd alſo *Teres*, and *Rotundus minor*, which is ſometimes wanting, or ſo confounded with the former, as to be loſt in it. It ariſes from the inferior Angle of the *Scapula*, and aſcending obliquely in a round fleſhy Body, and paſſing over the upper Head of the *Longus*, is inſerted by a ſhort flat Tendon, below the Neck of the *Os Humeri*.

Subſcapularis. App. Tab. xlii. Fig. ii.

The *Subſcapularis* ariſes from the *Baſis* and *Coſta* of the *Scapula*, and ſpreading itſelf under the whole Convex, or under-ſide of it, is inſerted by a ſemicircular Tendon into the Neck of the *Os Humeri*, and draws it down to the ſide of the Trunk.

Rotatory Motion.

The Tendons of theſe three laſt Muſcles make together a Circle about the Head of the *Humerus*, and, acting ſucceſſively after each other, give a rotatory Motion to the whole Arm.

Cubitus.

The Bones of the next Joynt, which reaches from the Elbow to the Wriſt, are the *Cubitus*, or *Ulna*, and *Radius*, upon which all the reſt of the Arm and Hand below the *Humerus* is mov'd together.

Ulna. Tab. xxi, xxii.

The *Ulna* is a pretty large, long, ſolid Bone, without any conſiderable Cavity for Marrow. The outſide of it is convex, the inner concave; having a *Foſſula*, or indented Chink, running along its middle the whole length of it. It is bigger on the upper, towards which it deſcends, as it were, tapering. At its Head, or upper end, it is joyn'd to the *Os Humeri per Ginglymum*, by means of its ſemi-lunar *Sinus*, which receives the

Ginglymus.

Olecranum.

Ligaments.

inner Protuberance of the lower end of the *Os Humeri*, and ſends off two Proceſſes, both call'd *Roſtra*, one on the fore-part, which enters the fore and leſſer *Sinus* of the *Os Humeri*; the other larger on the hinder-part, and longer, called (after *Hippocrates*) by a peculiar Name, *Olecranum*; which is receiv'd into the hinder *Sinus* of the aforeſaid Bone, forming thereby a perfect *Ginglymus*; whereby it is moved upon this Bone as by a Hinge, which is ſtrengthned and ſecured by the Ligaments, which from theſe Proceſſes are ſent up to the *Humerus*, as well as by thoſe which deſcend to it from the lateral Tubercles of the Proceſſes of the *Humerus*, already mention'd.

It has alſo, at its upper end, another ſmall lateral *Sinus* on the inſide, which receives the circumference of the round Head of the *Radius*, which rolls upon it for the Pronation, or turning down of the Palm of the Hand; or Reſupination, which is the turning of it up; which Motions are perform'd here by means of the *Radius*.

The lower end of the *Cubitus* is ſmall and round, and is receiv'd into the lower end of the *Radius*, by a *Sinus* in the ſide of it. Upon this Extremity the *Ulna* has a ſmall Proceſs, call'd *Styloides*, from which riſe the Ligaments which faſten it to the Bones of the *Radius*, and tie thoſe Bones likewiſe to one another.

Radius, *or* Focile minus. Tab. xxi, xxiii.

Articulations.

The *Radius* is a long ſlender Bone, which deſcends along with the *Ulna*, from the Elbow to the Wriſt, touching only at the Extremities; at the upper of which it is received by the *Cubitus*, as the lower receives it, making by both Articulations an imperfect ſort of *Ginglymus*. The upper end of this Bone, which rolls upon the *Ulna*, is cover'd with a Cartilage, and has on its top a ſmall round Indentation, or *Sinus*, which receives the outer Proceſs of the *Humerus*. The lower end of this Bone is thicker than the upper; and has beſides the lateral *Sinus*, which receives the *Cubitus*, two other *Sinus* at its Extremity, which receives the Bones of the Wriſt. Both theſe Bones are a little incurvated, by which means they are kept from approaching each other, except at their Extremities, and are ty'd together by a ſtrong Membranous Ligament.

Sinus.

Vid. Tab. xxi, xxii.

The Muſcles of the Cubit are in number five; two Flexors, and three Extenſors. The Flexors are firſt.

Muſcles of the Cubit.

The *Biceps*, ſo call'd from its ſpringing from two Heads; one of which riſes round and tendinous, from the upper edge of the Neck of the *Scapula*, and is convey'd along the Channel in the Head of the *Humerus*. Mr. *Cowper*, in his Book of the Muſcles, tells a remarkable Caſe of a Diſlocation, or ſlipping of this Head out of this Channel. The other ariſes from the *Proceſſus Coracoides*, broad and tendinous, and both together unite on the fore-part of the *Humerus*, about the middle, and is by moſt Authors ſaid to terminate in a round ſtrong Tendon into the Tubercle, at the upper end of the *Radius*. But Mr. *Cowper* has obſerv'd it to be double, and to expand it ſelf in form of a Membrane, over the *Pronator teres Radii*, and to join with the *Membrana Communis Muſculorum* of the *Carpus* and Fingers. This may be accounted common to both *Radius* and *Cubitus*.

Biceps. Tab. xxiii, xxiv.

The next is *Brachiæus internus*; which lies under the former, and ariſes fleſhy from the internal part of the *Humerus*, at the Inſertion of the *Deltoides* and *Coracobrachialis*, and running over the Juncture of the *Humerus* and Cubit, is inſerted partly fleſhy, partly tendinous, into the ſuperior and fore-part of the *Ulna*, and bends the Arm.

Brachiæus internus. Tab. xxv.

The next is *Gemellus*, or *Biceps externus*; which riſes with two Heads: One tendinous from the upper

Gemellus. Tab. xxvi. xxvii.

upper part of the inferior *Coſta* of the *Scapula*; whence it paſſes between the two round Muſcles to the back-part of the *Humerus*, where it joyns its other Head; from whence they run both together, to their Inſertion at the *Ancon*, or tip of the Elbow, made by the *Olecranum*, or outer Proceſs of the Cubit. This is the firſt Extender of the Cubit, and is by moſt Authors reckon'd two diſtinct Muſcles; the firſt being call'd *Longus*, and the other *Brevis*.

Longus. Brevis.

Brachiæus externus. Tab. ib.

The third is the *Brachiæus externus*: It ariſes from about the middle of the back-part of the *Humerus*, a little below the *Brevis*, and goes to one common Inſertion with the former at the *Olecranum*. This may alſo be reckon'd a third Head of the ſame Muſcle; which may therefore be call'd *Triceps Brachiæus*.

Anconæus. Tab. xxvi, xxvii.

The *Anconæus* ariſes from the inferior and back-part of the *Humerus*, and is inſerted laterally into the *Ulna*, about an Inch, or Inch and half below the *Olecranum*. Theſe are all Extenders.

Muſcles of the Radius.

The *Radius* has beſides the *Biceps*, which is common, four proper Muſcles; which ſerve to make it roll upon the Cubit or *Ulna*.

Pronator Radii teres. Tab. xxv.

The firſt is the *Pronator Radii teres*, by ſome call'd *ſuperior Rotundus*; which ariſes fleſhy from the internal Extuberance of the *Humerus*, and is inſerted obliquely into the middle of the *Radius* outwards.

Pronator Radii quadratus. Tab. xlii. Fig. v.

The next is the *Pronator Radii quadratus*, or inferior; which ariſes broad and fleſhy, from the lower and inner part of the *Ulna*, and paſſing over the Ligament, that joyns the *Radius* and the Cubit, is inſerted broad into the upper and external part of the *Radius*. Both theſe turn the Palm of the Hand inwards.

Supinator. Longus. Tab. xxiv.

The other two are the *Supinatores*: The firſt, which is call'd *Longus*, ariſes broad and fleſhy, from the ſuperior and external part of the *Humerus*,

rus, two or three Fingers breadth below the Inſertion of the *Deltoides*, and deſcending obliquely, is inſerted with a broad flat Tendon, into the external and lower part of the *Radius*, near the *Carpus*.

Supinator Brevis. Tab. xxvii.

The ſecond is the *Supinator brevis*; which ariſes tendinous and fleſhy from the upper part of the outſide of the *Ulna*, and paſſing obliquely over the *Radius*, is inſerted into its upper and forepart, juſt below the Tendon of the *Biceps*. Theſe turn the Palm of the Hand upwards.

Though our Method has oblig'd us to deſcribe the Muſcles of the *Radius*, immediately after thoſe of the *Ulna*, that the Action of thoſe two Bones, ſo extraordinarily united, may be ſeen together: Yet it is worth the notice of a young Diſſector, that theſe four laſt Muſcles are not fairly to be exhibited by the Knife, till the Muſcles of the *Carpus*, *Vola*, or Palm, and even of the Fingers, have been examin'd, and in part at leaſt rais'd.

Manus. *Parts.*

The Hand, which is by ſome call'd *extrema Manus* (theſe reckoning the Arm and Shoulder-bone into the Hand) is divided into three Parts: The *Carpus*, in *Engliſh*, the Wriſt; the *Metacarpium*, which alone is in Vulgar *Engliſh* call'd the Hand; and the Fingers.

Carpus. Tab. xxi, xxii.

The *Carpus*, or Wriſt, conſiſts of eight ſmall Bones, of different Figures and Sizes; theſe lie in Rows or Ranks, four in each. The upper four of which are articulated on their ſuperior Part, with the lower end of the *Radius*; the under four to the Bones of the *Metacarpus*. They are firmly faſtned together to one another, by the Ligaments that come from the *Radius* beforemention'd, and by that expanſion of the Tendon of the *Biceps*, which in the Deſcription of that Muſcle, we have taken notice to have ſpread itſelf over all thoſe Parts.

Faſcia tendinoſa.

The

Metacarpium. Tab. xxi, xxii.

The *Metacarpium* only conſiſts of four Bones, reaching from the four lower Bones of the *Carpus*, to the firſt of the Fingers. Theſe are long, ſlender and fiſtulous, having within a Cavity pretty conſiderable for their ſize, fill'd with Marrow. They are a little incurvated, convex on the exterior part, which is call'd *Dorſum Manûs*, which with us is call'd the Back of the Hand; and concave on their interior, which is call'd *Vola*, or the Palm of the Hand. Theſe Bones, like thoſe of the *Radius* and *Cubitus*, touch one another only at their Extremities, leaving Interſtices in the middle, for the paſſage of the *Muſculi Interoſſei.* At the upper end of each is a ſmall *Sinus*, which receives the Bones of the Wriſt; and at the lower end a ſmall round Head, which is receiv'd by a ſmall *Sinus* in the Bones of the Fingers.

Dorſum Manûs.

Vola.

Bones of the Fingers. Tab. xxi, xxii.

The Bones of the Fingers are in each Hand fifteen, three to the Thumb, and three to each Finger, diſpos'd in three rows, which are call'd *Phalanges*; the upper of which is the longeſt and largeſt, the ſecond leſs, but longer and larger than the third. They are all a little round, and convex on the back-part, but flat and plain on the inſide, with a very ſmall Hollow: Laterally they have a ſmall Convexity between the extremities of each Bone, of the two firſt Rows eſpecially, made by the Protuberance of their extremities, which wearing off gradually, makes the Depreſſion moſt conſiderable in the middle. This in the two middle Fingers is alike on both ſides, but in the fore and little Finger, greater on the inſide than the outer. The upper Row has in the Head of each Bone a ſmall *Sinus*, which receives the Protuberances of the Bones of the *Metacarpium.* At the lower end they have a little round Head, which is receiv'd again by the Bones of the ſecond Row; which have like the former, each a Cavity at the top, and a Protuberance at the bottom, for the ſame uſe. The third and laſt, receive the ſecond as they did the firſt.

Thumb. The Thumb is immediately articulated with the *Carpus*; and its Bones, with reſpect to one another, bear the ſame Number, Order, Proportion and Articulation with the former.

In the Articulations of the Bones of the two lower Joints with each other, and the firſt, the Eminence of the Bone receiv'd, is as it were parted into two; and accordingly, the *Sinus* in the Bone below, which receive them, muſt be ſo.

Oſſa Seſamoidea. Beſides theſe, there are fifteen very ſmall Bones, call'd *Seſamoidea*, from ſome fancy'd reſemblance in Bulk and Figure to Grains of *Seſamum*; and are plac'd, one on the inſide of each *Internodium*, or Joint of the Fingers, and ſeem to ſerve as a ſort of *Trochleæ*, or *Pullies* for the Tendons that bend the Fingers, and may be reckon'd as little *Patellæ*.

Ligaments. *Long.* Theſe Bones are held together by ſeveral Ligaments, two whereof ſerve particularly for the Bones of the *Carpus*; one, a long one, riſing from the lower part of the *Cubitus* and *Radius*, and ſpreading over the Bones of the *Carpus*, connects them together: The other is a round Annulare. Tab. xxiii. N. one, or as ſome will have it, two tranſverſe, that meet together, and encloſe the *Carpus* in the manner of a broad Ring. There are ſeveral Fibres interſperſed about the Bones of the *Metacarpus* and Fingers, and which ſerve to connect them together, but have no particular Names or Deſcriptions.

Muſcles of the Palm of the Hand and Wriſt. The Muſcles of the *Carpus*, or Wriſt, come next to be deſcribed, according to our Method: But the Muſcles of the Palm of the Hand lying immediately over them, and having ſome Influ-

ence

ence on the Motion of the *Carpus*, we ſhall begin with them.

Palmaris Longus. Tab. xxiii.

Theſe are in Number two: The firſt is call'd *Palmaris Longus*, and riſes from the internal Extuberance of the *Humerus*, with a narrow Origin, which ſoon increaſes to a fleſhy Belly, and again becoming tendinous, runs in a flat ſlender Tendon along with the Tendon of the *Flexor Carpi ſuperior*, to which it ſometimes firmly adheres; whence running over the *Ligamentum Annulare*, it expands itſelf, and cleaves faſt to the Skin of the Palm, and is inſerted laterally, by a ſeveral Tendon, into the Root of each Finger. The fleſhy beginning of this Muſcle has been obſerv'd to be ſometimes wanting, or perhaps ſo perplex'd with the Fibres of other Muſcles, as to be loſt to Obſervation: A thing very common amongſt the Muſcles, and which probably has occaſion'd thoſe great differences among Anatomiſts, in their accounts, as to the Number and Structure in almoſt all Parts of the Body.

Palmaris Brevis. Ibid.

The ſecond is the *Palmaris Brevis*, or *Quadratus*: A Muſcle by many Anatomiſts not taken notice of, though deſcrib'd by *Fallopius*, *Spigelius* (who calls it *Caro quadrata*, and makes it ſerve to extend the Hand) and ſome other Anatomiſts, but very imperfectly. It ariſes from the outſide of the Bone of the *Metacarpus*, which is articulated with the little Finger, and from one of the *Carpus*, with a broad membranous Tendon, and running tranſverſe, is inſerted into the eighth Bone of the *Carpus*.

Action.

The firſt of theſe ſerves to contract the Palm in graſping: The ſecond to draw it into a hollow Figure.

Diviſion of the Bones of the Wriſt.

The Muſcles properly of the Wriſt are four: Two *Flexors*, which are internal; and two *Extenſors*, which are external.

Flexor Carpi Ulnaris. Tab. xxiii, xxv.

The firſt *Flexor* is the *Cubitæus internus*, call'd alſo *Flexor Carpi Ulnaris*; which ariſes tendinous from the inner Extuberance of the *Humerus*, and upper part of the *Ulna*, upon which it runs along, till paſſing under the *Ligamentum Annulare*, it is inſerted by a ſtrong ſhort Tendon, into the fourth Bone of the firſt Row of the *Carpus*.

Flexor Carpi Radialis. Ibid.

The next is *Radiæus internus*; which riſes from the ſame Part with the former, and running along the *Radius*, is inſerted into the upper part of that Bone of the *Metacarpus* which is joyn'd with the fore-finger. Both theſe Muſcles bend the Wriſt.

Action.

Extenſor Carpi Ulnaris. Tab. xxvi.

The firſt Extenſor, is the *Cubitæus internus*, or *Extenſor Carpi Ulnaris*; which coming from the internal Protuberance of the *Humerus*, and paſſing tendinous under the *Ligamentum Annulare*, is inſerted into the upper part of the Bone *Metacarpium*, that anſwers the little Finger. If this and the *Ulnaris Flexor* move together, they draw the Hands ſideways towards the *Ulna*.

Action.

Extenſor Carpi Radialis. Tab. xxvi.

The next is the *Radiæus externus*, call'd alſo *Bicornis*, and *Extenſor Radialis*; which is rather two diſtinct Muſcles: The outermoſt ariſing fleſhy, above the external Protuberance of the *Os Humeri*; the inner below that Protuberance. Both run along the exterior part of the *Radius*, and paſſing under the Tendons of the *Extenſores Pollicis* and *Ligamentum Annulare*, are inſerted into the upper parts of the Bones *Metacarpium*, that articulate with the fore and ſecond Finger. Theſe, with the *Radiæus internus* together, draw the Hand ſideways towards the *Radius*: With the Muſcle foregoing they conſpire to extend it.

Action.

Muſcles of the Fingers.

The Muſcles of the Fingers are ſome common to all the Finger, and ſome proper. The common ones are thoſe which have their Origins from the Bones of the Arm, as the *Sublimis*, *Profundus*, *Lumbricales*, and the *Extenſor communis Digitorum*.

gitorum. The proper are ſuch as have their diſtinct Originations and Terminations without intermixture, in each reſpective Finger. Theſe are the *Interoſſei*, the Extenſor and *Abductor Indicis*, the Extenſor and Abductor of the little Finger.

Perforatus. Tab. xxv. The firſt of the common is the *Sublimis*, or *Perforatus*; ſo call'd from the Perforations of its Tendons by thoſe of the *Perforans* next to be deſcrib'd, and *Flexor ſecundi Internodii*, from its Action. It ariſes tendinous, from the internal Protuberance of the *Humerus*, between the *Flexores Radii*, and from the upper part of the *Radius* before; and being parted into four, paſſes under the Annular Ligament, whence it ſends a ſeveral Tendon into the upper part of the ſecond *Phalanx* of each Finger; every Tendon having at the firſt Internode, a Slit or Perforation for the Admiſſion of the Tendons of the *Profundus*,

Perforans. Tab. xxv. App. Tab. xliii Fig. iv. Or *Perforans*, or *Flexor tertii Internodii*; which ariſes fleſhy from the fore and upper part of the *Ulna*, and from the Ligament which joins that and the *Radius*, and after having form'd a pretty thick fleſhy Body is ſplit into four round Tendons, which paſſing under the Annular Ligament, and through the Slits in the Tendons of the former, are inſerted into the third Bone of each Finger.

This Perforation through the Tendons of the former Muſcle, and the membranous Caſes which the Tendons of both theſe Muſcles receive from the *Aponeuroſis Palmaris*, is ſingular in theſe Muſcles, and thoſe of the Feet.

Lumbricales. Ibid. The *Lumbricales* are commonly ſuppoſed to be nothing but Branches of the Tendons of the *Perforans*, which go to the inſide of the firſt Bone on each Finger, and are thought to contribute to the variety of Motions which the Fingers

Action. have, by giving a diverſion to the direct Actions of the other Muſcles; but ſimply, they only ſerve to draw the Fingers towards the Thumb. But Mr. *Cowper* has obſerv'd ſome of them to have diſtinct Originals, and ſuſpects that the reſt may have ſo, and therefore makes them diſtinct Muſcles.

Extenſor communis Digitorum. Tab xxvi.

The *Extenſor communis Digitorum* ariſes ſharp and tendinous, from the outward Extuberance of the *Humerus*, and becoming fleſhy about the middle of its Progreſs, divides, and paſſes with three Tendons under the annular Ligament, and is inſerted into all the Bones of the three firſt Fingers, near the firſt *Internodii*. Theſe Tendons ſend ſome Fibres to each other, as likewiſe do the *Interoſſei* to them before they terminate.

Interoſſei.

The *Interoſſei* are in number eight, as ſome will have it, reckoning the *Abductores* of the *Index*, and *Auricularis* amongſt them. They are divided into Internal and External: The Internal ariſe from the Bone of the *Metacarpus*, and lie in the Spaces that theſe Bones make towards the Palm of the Hand, from whence they ſend ſmall Tendons to the inſides of the lower *Phalanx* of the Fingers, and join with the Tendons of the *Extenſor communis*. The External ariſe likewiſe from the upper parts of the *Metacarpus*, towards the *Carpus*, and lie in the Interſtices form'd by thoſe Bones, and ſend their ſhort Tendons to the outſides of the firſt Bones of the Fingers; but their longer Tendons join with thoſe of the *Lumbricales*, and paſs to their Inſertions in common with the *Extenſores Digitorum*. *Action.* Theſe not only draw the Fingers from each other, but ſerve to extend them.

Abductor Indicis. Tab. xxvi.

The *Abductor Indicis* ariſes from the inſide of the Bone of the Thumb, and is inſerted into the firſt Bone of the Fore-finger, which it draws towards the Thumb. *Action.*

Abductor Auricularis.

The *Abductor* of the *Auricularis*, or little Finger (by ſome call'd *Hypothenar*) ſprings from the *Ligamentum Annulare*, and from the third and fourth Bone of the *Carpus*, in the ſecond Rank, and is inſerted externally into the firſt Bone of the little Finger, which it draws from the reſt. Neither of theſe two can therefore be reckon'd among the *Interoſſei*; which ſtrictly, are thoſe only which ariſe from among the Bones of the *Metacarpus*: However, they ſerve, when they act all together, to expand the Fingers; and theſe do the ſame particular Office which ſome of the *Interoſſei* do for the other Fingers.

Action.

Extenſor Indicis. Tab. xxvii.

Beſides theſe Muſcles proper to the Fore-finger, is the *Extenſor Indicis*, which riſing from the middle of the *Ulna* outwards, paſſes under the Annular Ligament, and at the third Bone of the Fore-finger joyns the *Extenſor communis*.

Auricularis.

The little Finger has likewiſe its proper *Extenſor*, which ariſes from the external Protuberance of the *Humerus*, and partly from the *Ulna*, and paſſing under the Annular Ligament, is inſerted into the outſide of the third Bone of the Finger.

Muſcles of the Thumb. Flexores Pollicis.

The Thumb is bent by two Muſcles: The firſt ariſes from the Internal Protuberance of the *Humerus*, and from part of the *Radius* by different Orders of Fibres, and paſſing under the *Ligamentum Annulare*, is inſerted into the third Bone of the Thumb. The ſecond ariſes from the Bones of the *Carpus* and the Annular Ligament, and is inſerted into the ſecond Bone of the Thumb. Theſe are call'd *Flexores Pollicis*.

It is extended by two Muſcles, which are called *Longus* and *Brevis*.

Extenſor longus. Tab. xxvi, & xxvii.

The *Extenſor longus* ariſes from the upper and external part of the *Ulna*, and paſſing over the Tendon of the *Radiæus externus*, is inſerted near the ſecond Joint of the Thumb. This has two

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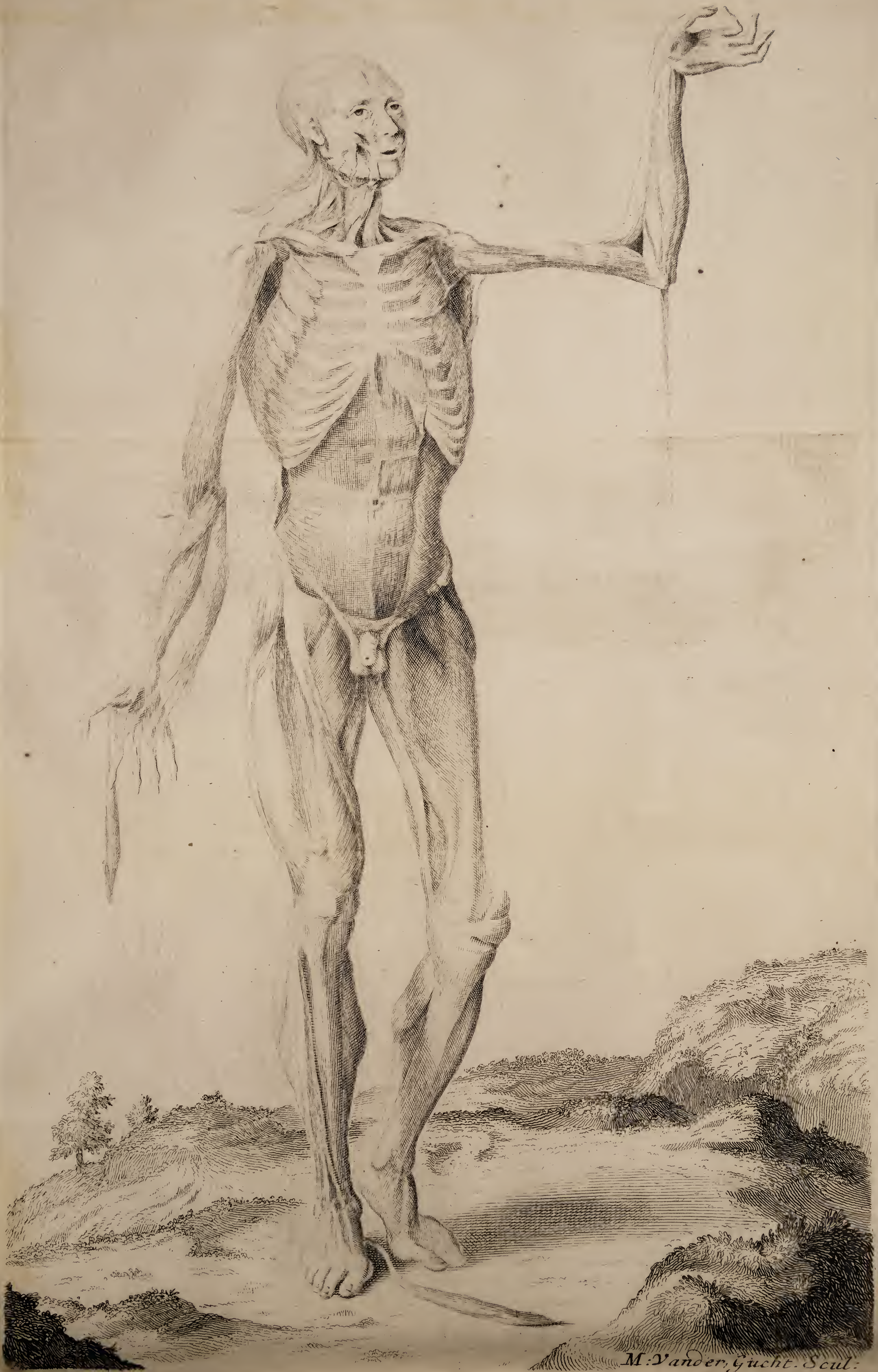
Tab: XXV. pag 423



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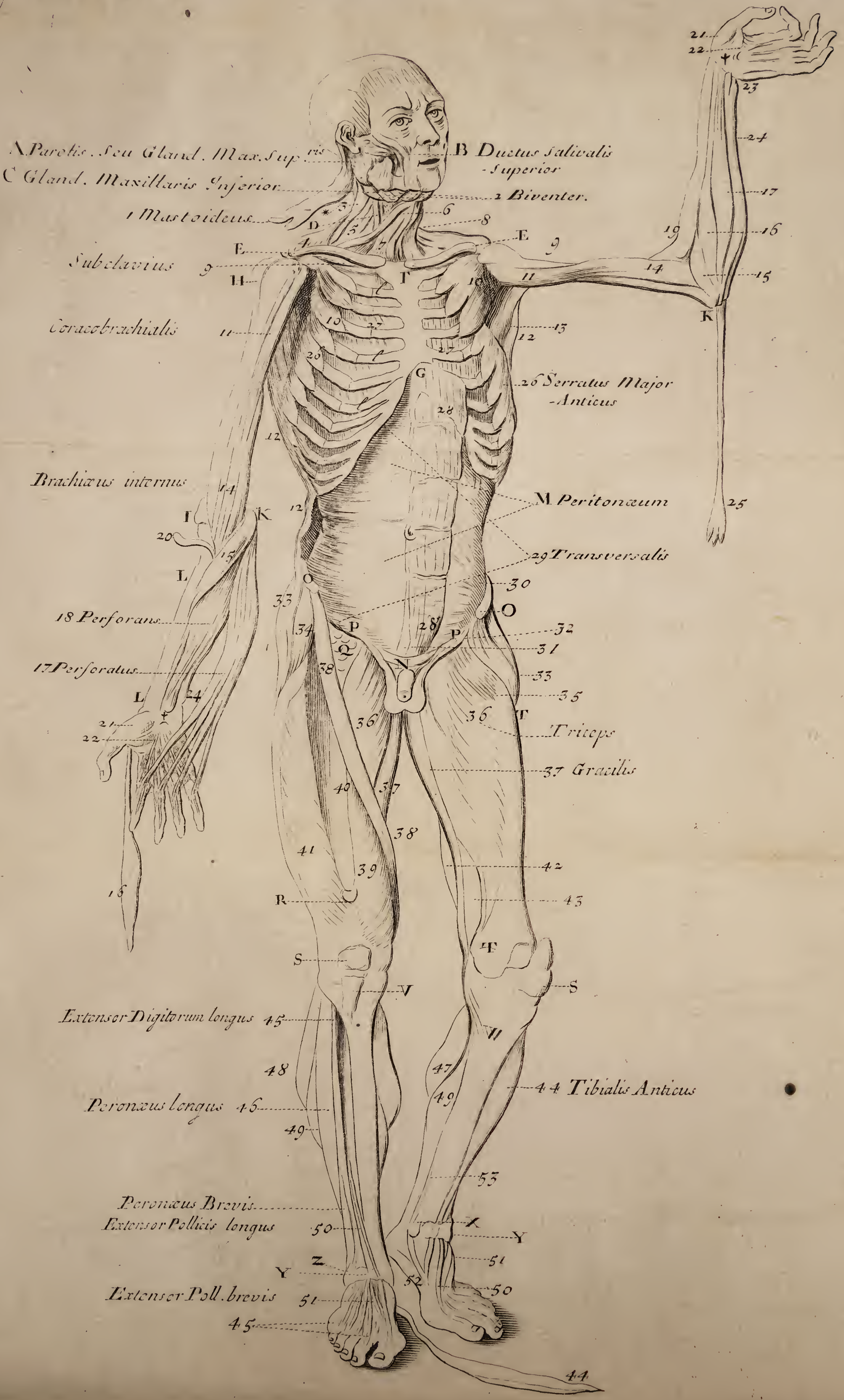
Tab. XXV.


A Parotis. Seu Gland. Max. Superioris
C Gland. Maxillaris Inferior
1 Mastoideus
Subclavius
Coracobrachialis
Brachiæus internus
18 Perforans
17 Perforatus
B Ductus salivalis Superior
2 Biventer.
26 Serratus Major Anticus
M Peritonæum
29 Transversalis
Triceps
37 Gracilis
44 Tibialis Anticus
Extensor Digitorum longus 45
Peronæus longus 46
Peronæus Brevis
Extensor Pollicis longus
Extensor Poll. brevis
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Tendons, and is ſeparable into two Muſcles, and is therefore frequently ſo reckon'd.

The *Brevis* ſprings from the *Ulna*, a little below the former, and is inſerted into the third Bone of the Thumb. Brevis. Tab. ib.

The *Abductor Pollicis*, call'd alſo *Thenar*, ſprings from the *Ligamentum Annulare* and firſt Bone of the *Carpus*, from whence paſſing to the Thumb, it makes that fleſhy Body which is call'd *Mons Lunæ*, and draws the Thumb from the Fingers. Abductor Pollicis Tab. xxiii.

The *Antithenar* ſprings from the Bone of the *Metacarpus*, that ſuſtains the Bone of the Fore-finger, and is inſerted into the fore-ſide of the firſt Bone, and draws the Thumb to the Finger. Antithenar. Tab. ib.

T A B. XXV.

SOme of the inferior Muſcles that appear on the Fore-part of the Body after their Superior and External ones are remov'd.

The Muſcles of the Face being referr'd to in the two preceding Tables, need no farther Explication in this.

A, The *Parotid*, or ſuperior Maxillary Gland.

B, Its Salival Duct paſſing over the *Maſſeter* Muſcle, before it goes through the *Buccinator*.

C, The inſerior Maxillar Gland.

1, The *Muſculus Maſtoideus* rais'd from the *Sternum* and *Clavicula*, and left at its Termination beind the *Proceſſus Maſtoides*.

2, The *Biventer*, or *Digaſtric* Muſcle *in ſitu*.

3, Part of the *Levator Scapulæ*.

* Part of the *Splenius*.

4, Part of the *Cucullaris* fix'd to the Clavicle.

5, Parts of the *Scaleni*.

6, The *Coracohyoideus* bared.

7, Part of the *Sternothyroideus*.

8, The *Sternohyoideus*.

D, The internal Jugular Vein.

EE, The *Clavicula*.

F, *Os Pectoris*, or *Sternum*.

G, The *Enſiformal Cartilage*.

H, A *Sulcus* in the *Os Humeri*, in which paſſes the Tendon of the External Head of the *Biceps*, here cut off.

I, The External Protuberance of the *Radius*

K, The Internal. --

LL, The *Radius*.

II, The Cartilaginous endings of the Ribs.

M, The Tendon of the transverſe Muſcle of the

Abdomen, paſſing to the *Linea Alba* cloſe upon the *Peritonæum*.

N, The *Os Pubis*.

O, The Spine of the *Os Ilium*.

PP, The Proceſſes of the *Peritonæum*, incloſing the Spermatick Veſſels.

QQ, The *Glandulæ Inguinales*.

R, The Tendon of the *Rectus Femoris*, or *Tibiæ* cut off at its union with the two *Vaſti*.

SS, The *Patellæ*.

TT, The Thigh-bone bared.

V, The Tendons of all the extending Muſcles of the Thigh, between the *Patella* and its Termination on the upper part of the *Tibia*.

W, The *Tibia*, or larger Bone of the Leg.

X, The *Malleolus internus*, or inner Ankle Bone.

Y, The *Ligamentum Annulare*.

Z, The *Malleolus externus*, or outward Ankle.

9, *Muſculus Subclavius*.

10, *Serratus minor Anticus*.

11, *Corobrachialis*.

12, Part of the *Latiſſimus Dorſi* on both ſides.

13, Part of the *Rotundus major*.

14, *Brachiæus internus*.

15, *Pronator Radii teres*.

16. *Radialis Flexor* in the right Hand hanging down to its Tendon.

17, *Perforatus* in both Arms; that in the Right being rais'd to ſhew the Slits in its Tendons, thro' which paſs the Tendons of the

18, *Perforans*.

19, Part of the *Supinator Radii longus* in the left Arm.

20 The Tendon of the *Biceps*, that ends in the upper part of the *Radius*.

21, *Abductor Pollicis*.

22, *Flexor ſecundi Oſſis Pollicis*.

23, *Abductor minimi Digiti*.

†† The *Ligamentum Annulare* in both Hands.

24, Part of the *Flexor Carpi Ulnaris*.

25, The *Palmaris longus* rais'd from its Termination, and hanging at its Origin, from the internal Protuberance of the *Os Humeri*.

26, The *Serratus major Anticus*, clear'd at its inſertion into the Ribs on both ſides.

27, The *Intercoſtales externi*.

28, 28, The *Rectus Abdominis* on the left ſide.

29 The *Tranſverſalis Abdominis*, with its Tendon paſſing on the *Peritonæum* M to the *Linea Alba*.

30, The *Obliquus aſcendens in ſitu*.

31, The *Pyramidalis*.

32, The *Cremaſter* Muſcle deſcending from its Origin at the fore-part of the Spine of the *Os Ilium* on the *Proceſſus Peritonæi* to the *Teſtes*.

33, The fore-parts of the *Glutæus medius* on both ſides.

34, The *Muſculus Membranoſus* at its Origin from the Spine of the *Os Ilium*.

35, The *Pectinæus*.

36, The *Triceps* in both

Thighs, that of the Left being laid bare.

37, The *Gracilis.*

38, *Sartorius.*

39, *Vaſtus internus.*

40, The *Crureus*, as it appears after the *Rectus Femoris* is removed.

41, *Vaſtus externus.*

42, Part of the *Seminervoſus.*

43, Part of the *Semimembroſus.*

44, The *Tibialis Anticus in ſitu*, on the left Leg, and diſſected, lying on the Ground from the Right.

45, 45, The *Extenſor digitorum Pedis longus in ſitu* on the right Leg.

46, The *Peronæus longus.*

47, The *Gaſtrocnemius internus.*

48, The *Gaſtrocnemius externus.*

49, 49, Parts of the *Soleus* in both Legs.

50, *Extenſor Pollicis longus.*

51, *Extenſor Pollicis brevis* in both Feet.

52, *Abductor Pollicis.*

53, Part of the *Tibialis Poſticus.*

CHAP. VII.

Of the BONES *and* MUSCLES *which form the* LOWER VENTER, *or* REGION *of the* TRUNK.

HAving done with the firſt Region of the Trunk, and the Parts appended to, and moving upon it; we come to the ſecond or lower: In which we ſhall conſider the Parts of the Loins and the *Pelvis* at their bottom; and according to our uſual Method, we ſhall firſt deſcribe the Bones which are the true *Vertebræ* of the Loins, the ſpurious ones of the *Os Sacrum*, and *Oſſa Innominata.*

Verbteræ *of the Loins.* Tab. xxi, xxii.

The *Vertebræ* of the Loins are in number five, and are larger and thicker than thoſe of the Neck or Back, and more looſely articulated one with another, for the more eaſy Inclination, or ſtooping of the Body downwards: They have the ſame Proceſſes with the other *Vertebræ*, with this difference, that in theſe the Spinal Proceſs is broader and thicker than elſewhere, and the tranſverſe Proceſs is longer, without any Perforation, as thoſe of the Neck have; neither has the Body of the *Vertebra* any lateral *Sinus*, as thoſe of the Back have, for the Reception of the Head of the Ribs. They are gradually larger, as they approach nearer to the *Os Sacrum*; which is indeed obſervable through the whole Tract of the Spine, from the Head downwards, the lower being every where ſomewhat larger than the upper: But this enlargement in the Loins is more remarkable than elſewhere, eſpecially in the laſt *Vertebra* of all, which joyns

Os Sacrum. Tab. xxi. xxii. The *Os Sacrum*, which conſiſts of ſix Bones; though ſometimes it has been obſerv'd to have one more or one leſs. Theſe are call'd *Vertebræ*, but ſpurious, and appear very diſtinct in Infants, but in Adults they generally coaleſce, ſo as to ſeem but one Bone of an Equilateral triangular Figure with the *Baſis* upwards, which is ty'd to the laſt *Vertebra* of the Loins, and laterally by long, thick and broad Proceſſes, to the *Os Ilium* on either ſide: The exterior, or back-part of the *Os Sacrum*, is rugged, and a little convex; the interior ſmooth and concave. Foramina. Tab. xxi. & xxii. It has ordinarily five Perforations on either ſide, which enlarging themſelves backwards and forwards, are in a manner double, through which paſs ſome of the Nerves which make the *Cauda Equina*, and are the Production of the Spinal Marrow, which has no farther Paſſage through the middle or great Perforation of the *Vertebræ*, than to the laſt of the Loins, theſe ſpurious of the *Os Sacrum* having no Hollow.

Os Coccygis. Tab. xxii. To the lower Bone of the *Os Sacrum* is joyn'd the *Os Coccygis*, conſiſting of three or four little Bones, and two Cartilages. It reſembles a little Tail; the lower Bone, as in the *Os Sacrum*, growing gradually leſs than the upper, till it ends in a Cartilaginous Point, which is turn'd inwards for the convenience of ſitting with Eaſe. Theſe Bones are but looſely joyn'd together, eſpecially in Women, in whom at the time of Parturition they eaſily give way, and are by skilful Midwives thruſt back at that time, without damage; but by the unskilful ſometimes ſo rudely, as to cauſe exceſſive Pain in the time of Labour, and many ill Conſequences after. This Bone ſerves to ſuſtain the *Inteſtinum rectum*, and has Muſcles in common with the *Anus*, to draw it upwards or inwards; taken notice of by *Joannis Riolanus*, *Anthropograph. Lib.* V. *Cap.* 40. after deſcribing the *Levatores Ani*, with the *Muſculi tranſverſales Penis*, which he thinks belongs to the *Anus*, he ſays, *Reperitur quintus Levator Ani, qui Coccygi & Oſſis Sacri extremo affigitur.* Theſe I call *Muſculi Coccygis:* They ariſe broad and fleſhy, from the *Os Iſchium*, at the extremity, and on each ſide a ſharp Proceſs of that Bone, that is between the *Muſculi Marſupialis* and *Pyriformis*, and terminate after an oblique deſcent on each ſide the *Os Coccygis*, and adjoyning part of the *Os Sacrum:* When they act, they draw the *Os Coccygis* upwards and inwards, and are Antagoniſts to two Ligaments, that ſpring from the back-part of the *Os Sacrum*, and terminate in the external Surface of the *Os Coccygis*, which keeps that Bone from being thruſt inwards on ſeveral occaſions, particularly in riding on Horſe-back, *&c.*

Muſculus Coccygis. Tab. xxvii.

Ligamenta.

The *Oſſa innominata* are two large Bones ſituated on either ſide of the *Os Sacrum*, and are called likewiſe *Oſſa Coxæ & Coxendicis*, in *Engliſh*, the Hip-Bones. In Infants each of theſe Bones conſiſts of three diſtinct ones, ſeparated by Cartilages, which in Adults grow up, and make but one firm ſolid Bone, whoſe Parts however retain three diſtinct Names, according to their former diviſion.

Oſſa Innominata.

Os Ilium. Tab. xxii. Spina Ilium. Dorſum, Coſta. Tab. ib.

The upper and broader part is call'd *Os Ilium*, from the Inteſtine of that Name, which lies in the inſide of it, and is join'd to the *Os Sacrum* by a Cartilage, and a very ſtrong membranous Ligament. The outward Rim of this Bone repreſents in Figure, a large Segment of a Circle, which is call'd the Spine of the *Ilium*. The back-edge of this Rim is call'd the *Dorſum*, and the inner *Coſta*. In Women this Bone is much larger than in Men, and the Spine of each farther diſtant from one another.

Iſchium. Tab. ib. Acetabulum. App. I. Fig. vi. Tab. xxii. xxxvi.

The lower part of the *Innominatum* is call'd the *Iſchium*, and by ſome peculiarly *Os Coxendicis*. The Cavity commonly ſaid to be in this Bone, call'd *Acetabulum*, is fram'd at the meeting of this with the *Ilium* and *Os Pubis*, as appears in the *Fœtus*; but in Adults no marks of this union appear in this large deep Cavity, in which the Head of the Thigh-bone is received; at the bottom of which lies a large mucilaginous Gland. It is lin'd and tip'd round with a Cartilage, whoſe circular Margin is call'd *Supercilium*. At its juncture with the *Os Pubis*, is the *Foramen Iſchii & Pubis*, a large Hole common to it and that Bone; and at its lower end a large Protuberance, which ſerves us like a Stool to ſit upon, and a little above it, on the hinder part, is another ſmall acute Proceſs, near which is a *Sinus*, that gives paſſage to the Tendon of the *Obturator internus*.

Os Pubis. Tab. xxi, xxii.

The fore-part of the *Innominatum* is the *Os Pubis*, or *Pectinis*; which is thinner and lighter than the reſt, and perforated as before-mentioned: This is join'd to its Fellow *per Synchondroſin*, or by an intermediate Cartilage, where in Women they form an Arch much larger than in Men: Beſides this difference, we find the Spines of the *Os Ilium* ſtand at a greater diſtance from each other, and that Bone much flatter in Women than in Men.

Pelvis. Tab. xxi.

All theſe Bones, which are larger and more concave in Women than in Men put together, form that Cavity in the bottom of the *Abdomen*, which is call'd the *Pelvis*; wherein lies in Men the Bladder of Urine, and part of the lower Inteſtines; and beſides theſe, in Women the *Uterus*, who having for the convenience of the *Fœtus*, a larger *Pelvis*, and wider opening below for the Paſſage of it, are therefore in proportion much larger about the Hips than Men.

Muſcles of the Loins.

Authors are very confus'd and perplex'd about the Muſcles which move the Loins; probably upon the account of that great and various Motion which no other part of the Trunk has: The moſt diſtinct and beſt agreed account reduces 'em to four Pair: Two of which are common to them and the Back, and two proper, or ſerving for their Motion only.

Longiſſimus Dorſi. Tab. xxvii. iii.

The firſt of the common is the *Longiſſimus Dorſi*, which riſes from the upper part of the *Os Sacrum*, *Os Ilium*, and the firſt *Vertebra* of the Loins, and in its beginning is confounded, if not the ſame with the *Sacrolumbalis*, deſcrib'd among the Muſcles of the Back. It runs upwards along the whole Tract of the Back, and is connected to every tranſverſe Proceſs in its way, and ends ſometimes in the firſt *Vertebra* of the Back, ſometimes in the firſt of the Neck, and (as ſome Authors ſay) reaches now and then to the *Proceſſus Mammillaris* of the *Os Petroſum*.

Semiſpinatus. Tab. ib.

Action.

The *Semiſpinatus* riſes from the Spines of the *Os Sacrum*, and in its Origin joins the *Latiſſimus Dorſi*. It runs over all the *Vertebræ* of the Loins and Back, and ſends a Tendon to every Spine, by which means it ſerves to erect the whole Trunk.

Sacer. App. Tab. xlvii. Fig. ii.

The *Muſcular Sacer* has its Origin on the hinder part of the *Os Sacrum*, and runs along under the *Longiſſimus Dorſi*, and with its ſeveral Tendons lays hold on the Spine, and every tranſverſe

Proceſs of the Loyns, and at the loweſt of the Back, where it ends. *Action.* This is likewiſe an *Erector*.

Quadrati. Tab. ib. The Loyns (beſides the natural Tendency of the Trunk downwards from its proper weight) are bent by a Pair of Muſcles call'd *Quadrati*, which ariſe broad and fleſhy from the inner Margin or *Coſta* of the *Ilium*, and from the *Os Sacrum*, and end in the tranſverſe Proceſſes of each *Vertebra* of the Loyns, and the laſt of the Back. *Action.* When either of theſe act ſeparately, it bends the Body laterally; together they ſtoop it forwards.

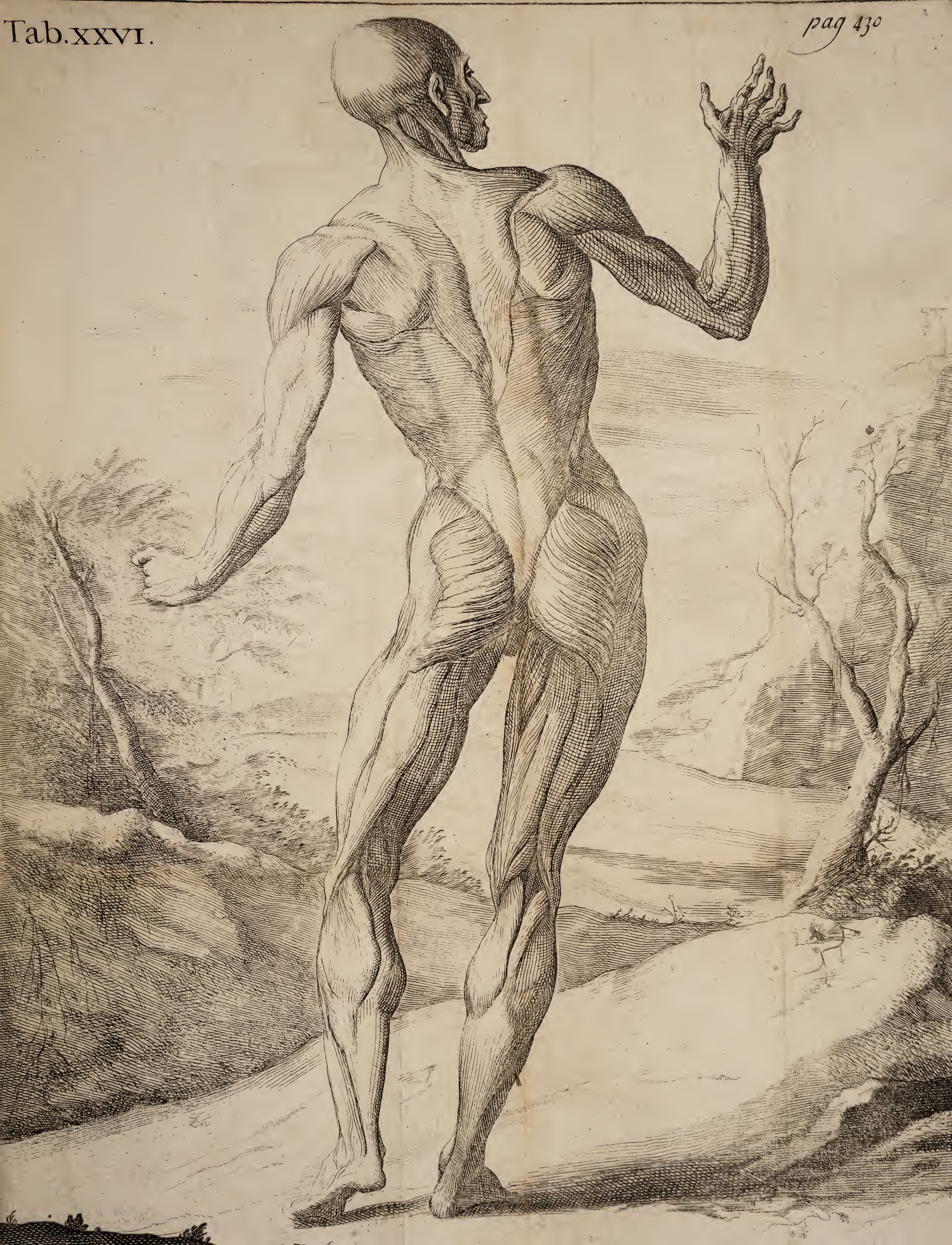
Pſoas parvus. The *Pſoas parvus* (tho' by moſt Authors reckon'd among the Muſcles of the Thigh) belongs properly to this Part, and riſes fleſhy from the ſides of the upper *Vertebræ* of the Loyns, and is inſerted into the *Os Innominatum*, at the Juncture of the *Pubis* and *Ilium*, with a broad thin Tendon, which embraces the *Pſoas* of the Thigh.

T A B. XXVI.

THE external Muſcles on the back-parts.

a, The *Os Jugale.*
b, The *Parotid* Gland.
c, The Spines of the *Vertebra* of the Back.
d, The *Baſis Scapulæ.*
1, The *Muſculus Occipitalis.*
2, Part of the *Temporalis.*
3, *Elevator Auriculæ.*
4, *Zygomaticus.*
5, Parts of the *Splenius.*
6, Part of the *Maſſeter.*
7, Part of the *Maſtoidæus.*
8, A ſmall Portion of the *Elevator Scapulæ.*
9, The *Cucullaris.*
e e, Its tendinous part that unites with its Partner.
e, Another Tendon of the *Cucullaris*, that terminates in the *Spina Scapulæ.* *
10, The *Deltoides.*
11, *Infraſpinalis.*
12, *Rotundus minor.*
13, *Rotundus major.*
14, *Gemellus*, or *Biceps externus.*
15, Part of the *Biceps.*
16, Part of the *Supinator Radii longus.*
17, *Extenſor minimi Digiti.*
18, *Extenſor Carpi Ulnaris.*

19, La.



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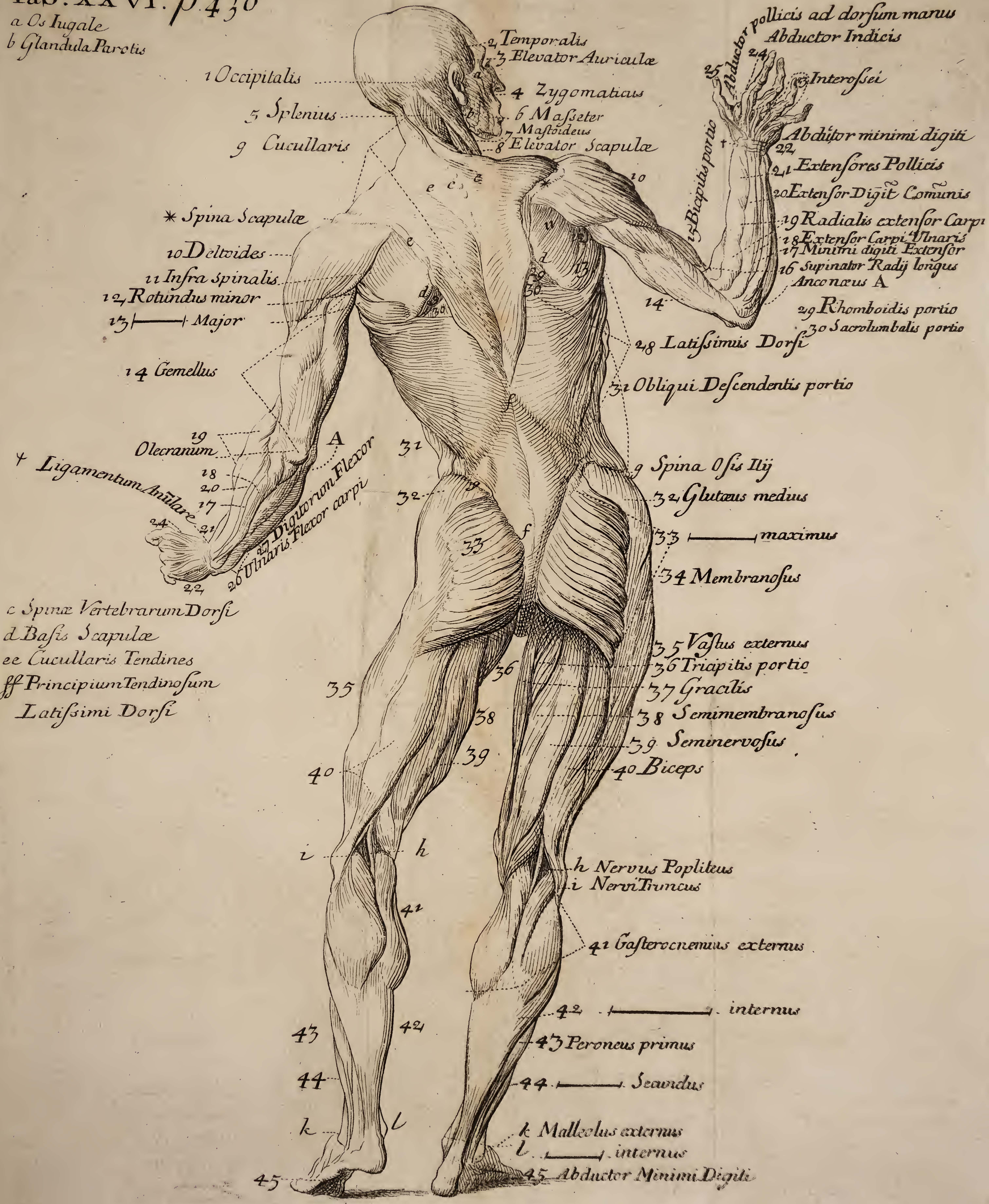

19, *Radialis Extenſor Carpi.*

20, *Extenſor Digitorum communis.*

21, The Muſcles extending the Thumb.

A A, The *Anconæus* in both Arms.

22, *Abductor minimi Digiti.*

23, *Intereſſei.*

24, *Abductor Indicis.*

25, *Abductor Pollicis ad Dorſum Manûs.*

26, Parts of the *Ulnaris Flexor Carpi* in both Arms.

†, The *Ligamentum Annulare.*

27, Part of the *Flexor Digitorum Perforatus* in the left Arm.

28, The *Latiſſimus Dorſi.*

f f, Its thin Tendon, which ſprings from the *Vertebræ* of the Back, Loyns, and *Os Sacrum*, under which are the beginnings of the *Muſculi Sacrolumbalis*, and *Dorſi longiſſimus.*

g, The Spine of the *Os Ilium.*

29, 29, Parts of the *Rhomboides*, near the lower Angles of each *Scapula.*

30, 30, Portions of the *Sacrolumbales* and *Dorſi longiſſimi* ſeen in the triangular Interſtice here expreſs'd.

31, 31, Parts of the oblique deſcending Muſcles of the *Abdomen.*

32, Parts of the *Glutæus medius.*

33, The *Glutæus maximus.*

34, A ſmall Portion of the *Membranoſus.*

35, *Vaſtus externus.*

36, Portions of the *Triceps.*

37, The *Gracilis* only ſeen in the right Thigh.

38, The *Semimembranoſus.*

39, *Seminervoſus.*

40, *Biceps.*

h, The Trunk of Nerves and Blood-Veſſels paſſing the Ham.

i, The Trunk of a Nerve marching with the Tendon of the *Biceps Femoris.*

41, 41, The *Gaſtrocnemius externus* and *internus.*

42, *Solæus.*

43, *Peronæus primus.*

44, *Peronæus ſecundus.*

k, The *Malleolus externus.*

l, The *Malleolus internus.*

45, The *Muſculus Abductor minimi Digiti.*

CHAP. VIII.

Of the BONES *and* MUSCLES *of the* THIGH, LEG, *and* FOOT.

Os Femoris. Tab. xxii.

THE Thigh has but one Bone, which is the largeſt and longeſt of the whole Body, exceeding the *Os Humeri* in length about a third, and in thickneſs more. It is call'd *Os Femoris*, and ſometimes ſimply *Femur*. It is pretty much incurvated, the convex part being before, and the concave behind. It has three *Epiphyſes*, which in Children are ſo diſtinct from the Bone as to be eaſily ſeparable.

Epiphyſes. Tab. ib.

Head.

The firſt of theſe is the largeſt and moſt prominent, and has a large round Head, capp'd with a Cartilage, which is receiv'd into the *Acetabulum* or Socket, at the *Iſchium* or *Os Coxendicis*; to which it is faſtned by two Ligaments: One broad, thick, and membranous, ſurrounding the whole Edge of the *Acetabulum*, and Head of the Bone: The other ſhort, thick, and round, ſpringing from the bottom of the *Acetabulum*, by the ſide of the Mucilaginous Gland, (which is here the moſt conſiderable of the whole Body) and is inſerted into the middle of the Cartilaginous Head. The *Epiphyſis*, or Neck of the Bone on which this Head is ſeated, ſprings laterally from the upper end of the Bone, by which means the Thighs are kept at greater Diſtance than otherwiſe they would be, and thereby make more room in thoſe Parts for ſeveral neceſſary Purpoſes.

Ligaments.

Neck. Tab. xxii.

Trochanter major. Tab. xxii.

The ſecond Proceſs, or *Epiphyſis*, is ſituated at the botttom of the Neck, on the outſide of the Thigh-Bone, and is call'd *Trochanter*, or *Rotator major*. It has a ſmall *Sinus*, in which are inſerted the *Quadrageminus* and *Obturator* Muſcles.

The third *Epiphyſis* is on the hind-part of the Bone, ſomewhat lower and leſs than the former, and is called *Trochanter minor.* The Surface of both theſe *Epiphyſes* is ſomewhat aſperous, for the better hold of divers Muſcles which are inſerted into them.

Trochanter minor. Tab. xxi, xxii.

The Body of the Bone is very hard, conſiſting of many *Laminæ*, or Plates of Bone, with interſpers'd *Cellulæ*, or *Loculi*, of which we have ſpoken more particularly in the general Deſcription of the Bones. It has within the longeſt and largeſt Hollow of any of the Bones fill'd with Marrow, the uſe and manner of whoſe Conveyance has been already ſpoken to. On the outſide it has a ſmall Ridge, which runs along it on the back-ſide, from one end to the other, where Muſcles are inſerted, and is call'd *Linea Aſpera.*

Body.

Linea Aſpera.

At the lower end it has two pretty large round Proceſſes, (improperly by ſome call'd Heads, from the reſemblance in Figure to the true Head) each cover'd with a Cartilage, between which is a large deep *Sinus*, by means of which it is articulated with the *Tibia* by a true *Ginglymus*, this *Sinus* receiving the Proceſs in the middle of the Head of the *Tibia.*

Lower Proceſſes. Tab. xxii.

The Leg, from the Knee to the Foot, is call'd *Tibia*, and conſiſts of two Bones; the inner whereof is not much inferior in length or bigneſs to the *Femur.* It is a large, hard, angular Bone, with a Cavity in the middle, tho' but ſmall for the bigneſs of the Bone. It has three edges or corners, which render it in a manner three ſquare; the foremoſt of which is the moſt acute, and is call'd the Shin: At the upper end it has two large *Sinus*, or Cavities, cover'd with a ſoft ſmooth Cartilage, call'd *Lunata*; theſe *Sinus* receive the two lower Proceſſes of the *Femur*, and are divided by an intermediate Proceſs, which enters the *Si-*

Tibia, *or* Focile majus. Tab. xxi.

nus at the lower end of the *Femur* before ſpoken of; ſo making a true *Ginglymus*, each Bone receiving and being received.

Patella. Tab. xxi. This Joint, which is call'd the Knee, is cover'd on the middle of the fore part by a pretty round Bone on the outſide, ſomewhat of the Figure of a Shield, about two Inches Diameter, ſomewhat convex on both ſides, but moſt on the outer, and cover'd with a ſmooth Cartilage. This Bone is call'd *Patella*, *Mola*, and *Rotula*, in *Engliſh* the Knee-Pan: Over it ſlides the Tendons of the Muſcles, that extend the Leg as upon a *Trochlea* or Pully; but its more peculiar uſe is to hinder the Leg from being bent forwards in Extenſion, as it neceſſarily muſt be in this ſort of Articulation, if this Bone did not, like a Bolſter, check its rolling too forwards, as the *Olecranum* does the Swing of the *Cubitus* too backwards in the Extenſion of that Joint, by catching the *Sinus* of the *Humerus*, and ſtopping it there. In an erect Poſture, when one Foot is ſet forward, the whole weight of the Body above bears upon the *Patella*, which in that ſituation hinders the Knee from bending backwards, and ſtraining the Muſcles that inflect it behind; which the weight of the Body, added to the force of the extending Muſcles, muſt otherwiſe neceſſarily occaſion; as in going down Hill, where the Body muſt neceſſarily reſt upon the extended Foot, which is ſet foremoſt till the other be brought forwards. Hence *Galen*'s Wreſtler, who had diſlocated his *Patella*, found ſo much Pain and Trouble in going down Hill.

Oſſa Seſamoidea. There are ſometimes found two *Oſſa Seſamoidea*, in the two beginnings of the *Gaſtrocnemius externus* Muſcle, but theſe are rarely met with, and only in aged Bodies.

Muſcles of the Thigh. Having thus far deſcribed the *Tibia* and *Patella*, only to ſhew the lower Articulation of the

Femur, we ſhall return to the Muſcles which move the Thigh, and proceed in our uſual Method.

Number. The Number of Muſcles which move the Thigh, is variouſly reported by Authors, who have been pleas'd to ſplit and join Muſcles, arbitrarily, as they thought fit: But the Number moſt generally agreed on is nine; tho' two of theſe being again ſub-divided, the *Triceps* into three, and the *Quadrigeminus* into four, they make in all fourteen. Some of theſe ſerve to bend the Thigh, others to extend it; ſome to draw it inwards, others outwards; and ſeveral of them acting together to give it a rotatory Motion, which this Joint has, tho' not ſo conſpicuous as the *Humerus*.

Pſoas major. App. Tab. xiv. Fig. i. The firſt of the *Flexores* is the *Pſoas Major*, or *Lumbaris*; which is a round, hard, fleſhy Muſcle, ariſing from the tranſverſe Proceſſes of all the *Vertebræ* of the Loins, and paſſing along on each ſide of the *Vertebræ*, runs over the ſuperior part of the *Os Sacrum*, and Spine of the *Ilium*, and is inſerted into the lower part of the leſſer *Trochanter*.

Iliacus internus. Ibid. The *Iliacus internus* ariſes fleſhy from the concave part of the inſide of the *Ilium*, and in its Deſcent joins with the *Pſoas*, and is inſerted with it.

Pectineus Tab xxv. The *Pectineus*, ſo call'd from its Origination at the external part of the *Os Pectinis*, riſes thick, broad, and fleſhy, and is inſerted on the hinder-part of the *Femur*, a little below the leſſer *Trochanter*. These three Muſcles conſpire to draw up the Thigh. *Action.*

Glutæi. The *Glutæi* are three Muſcles of the ſame Name, which co-operate in extending the Thigh: *Action.* The firſt, which is call'd *Major*, ariſes ſemicircular from the *Os Coccygis*, the Spines of the *Sacrum*, and the Spine of the *Ilium*; whence form- Major. Tab. xxvi.

ing a large fleſhy Muſcle, it deſcends to the *Linea Aſpera*, four Fingers breadth below the great *Trochanter*.

Glutæus medius. Ibid. The *Glutæus medius* ariſes fleſhy from the external part of the Spine of the *Ilium*, and is inſerted by a ſtrong ſhort Tendon, into the ſuperior external part of the great *Trochanter*.

Glutæus. minor. Tab. xxvii. The *Minor* lies under the former, and ariſes ſemicircular, broad, and fleſhy from the *Dorſum Ilii*, and ends at the upper part of the great *Trochanter*. Theſe three Muſcles together make the Fleſh of the Buttocks.

Triceps. Tab. xxv. The *Triceps* is properly three Muſcles, which ſpring all from the *Os Pubis*: One at its Juncture at the *Iſchium*, another from the middle, and the third from the lower part; and are inſerted all, one above another, into the *Linea Aſpera*, of which they take up the greater part; the lower reaching to the lower *Apophyſis* of the Thigh-Bone inwards. *Action.* Theſe are the *Adductores*, and draw the Thighs together.

Quadrigeminus. The next is the *Quadrigeminus*, which conſiſts likewiſe of four Muſcles, which turn the Thigh outwards.

Pyriformis. Tab. xxvii. The firſt of theſe is the *Pyriformis*, or *Iliacus externus*, which ariſes from the internal concave part of the *Os Sacrum*, towards the bottom, and deſcending obliquely along the great *Sinus* of the *Os Ilium*, from a round fleſhy Origin, joyns the *Glutæus medius*, and is inſerted by a round Tendon at the bottom of the great *Trochanter*.

Gemini. The ſecond and third are call'd *Gemini*. They ariſe from the *Os Pubis* and *Iſchium*, and the Ligament that ſpreads over the great *Foramen*, and being broad and fleſhy, are by Authors divided into the *Marſupialis*; ſo call'd from an imaginary reſemblance of a Purſe: The other *Obturator internus*, not from its uſe, but from its running over and covering the great *Foramen*. They are both

Marſupialis. Tab. xxvii. Obturator internus.

both inſerted into the *Sinus*, at the bottom of the great *Trochanter*.

Quadratus. Ibid.

The fourth is the *Quadratus*, which riſes from the *Apophyſis* of the *Iſchium*, and maintains an equal breadth and bulk to its Inſertion, juſt below the great *Trochanter* on the outſide.

Obturator externus. Ibid.

The laſt is the *Obturator externus*, nam'd likewiſe from its ſituation. It ariſes fleſhy from the exterior Margin of the *Os Pubis* and *Iſchium*, and is inſerted tendinous at the Root of the great *Trochanter.*

Some Authors have deſcrib'd another *Obturator internus*, but they ſeem to have been confounded by the different Names and ways of deſcribing that have been us'd by Anatomiſts, and to mean only that part of the *Marſupialis* which Mr. *Cowper* has call'd *Obturator internus.* But we leave this to the Deciſion of farther Enquiry.

The Head of the *Tibia*, and its Articulation with the *Femur*, has been already deſcrib'd, the better to give an Idea of their Motion together: For the ſame Reaſon the *Patella* likewiſe has been deſcrib'd, that we might not be oblig'd to return to that Articulation.

Lower end of the Tibia. Malleolus internus. Tab. xxi.

The lower end of the *Tibia* is much ſmaller than the upper, and has a conſiderable Proceſs which forms the inner Ankle; and a pretty large *Sinus*, divided in the middle by a Proceſs, which is receiv'd into the concave part, or *Sinus* of the *Aſtragalus*, as its *Sinus* receives the convex part of the ſame Bone.

Fibula. Ibid.

The Leg conſiſts likewiſe of another Bone, which is call'd *Perone*, *Fibula*, *Sura*, and *Focile minus*; which lies on the out-ſide of the Leg, and is joyn'd at the upper end to the *Tibia*, juſt below the Knee, by a *Sinus*, which receives the lateral Protuberance of the upper end of the *Tibia.* Its lower end is receiv'd into a *Sinus* of the *Tibia*, and then ſhoots out into a large Proceſs, Malleolus externus. Ibid.

which makes the outer Ankle, and embraces the outſide of the *Aſtragalus.* The *Tibia* and *Fibula* touch one another only at their Extremities, like the *Radius* and *Cubitus*, and are join'd *per Arthrodiam:* Beſides which, they are ty'd together by a ſtrong membranous Ligament, which fills up the Cavity between the two Bones. On the inſide of this outer Ankle is a *Sinus*, to which anſwers a Protuberance in the *Talus.*

Muſcles.

The *Tibia*, or Leg, is bent by four hinder Muſcles, extended by four: It is moved inwards by one, and outwards by two.

Biceps. Tibiæ. Tab. xxvi.

The Muſcles that bend the Knee, are, firſt the *Biceps*, which is a double-headed Muſcle: The firſt of whoſe Heads ariſes with a round Tendon from the Protuberance of the *Iſchium*, and becoming fleſhy after about half its Progreſs, is join'd by the other from the *Linea Aſpera* of the *Femur.* The Bellies of this Muſcle are likewiſe diſtinct, which joining at laſt in a Tail or Tendon, are inſerted into the hinder-part, or upper *Apophyſis* of the *Fibula.*

Seminervoſus. Ibid.

The *Seminervoſus* ariſes half fleſhy, half tendinous, near the former, and is inſerted by a round Tendon into the internal *Epiphyſis* of the *Tibia.*

Semimembranoſus. Ibid.

The *Semimembranoſus* ariſes from the ſame Eminence of the *Iſchium*, a little higher, and is inſerted by a ſhort thick Tendon into the upper and back part of the *Tibia.*

Gracilis. Tab. xxv.

The *Gracilis*, ſo call'd from its being the ſlendereſt of theſe Muſcles, ariſes from the Juncture of the *Os Pubis* and *Iſchium*, and is inſerted into the upper and inner ſide of the *Tibia.* Theſe four bend the Knee.

Action.

The Leg is extended likewiſe by four Muſcles; which are the *Rectus*, the two *Vaſti*, and the *Crureus.*

Rectus. Tab xxiii xxiv.

The *Rectus* ariſes with a ſharp beginning, from a Protuberance a little below the Margin of the

Spine of the *Ilium*, between that and the *Acetabulum.* It runs with a ſmooth Belly between the two *Vaſti*, and becoming gradually tendinous, ends at the Protuberance of the *Patella*, a little below the Knee.

The *Vaſti* are two, *Externus* and *Internus*, ſo nam'd from their largeneſs, by a barbarous *Latin* Term.

Vaſtus externus. Tab. xxiii xxiv, xxv.

The *Vaſtus externus* ſprings from the Root of the great *Trochanter*, and from the *Linea Aſpera*, outwardly tendinous, and inwardly fleſhy, and deſcending obliquely forwards, becomes *vice verſa* tendinous internally, and fleſhy externally, till meeting with the Tendon of the former, it grows entirely tendinous, and is inſerted together with it.

Internus. Ibid.

The *Vaſtus internus* ariſes likewiſe partly tendinous, and partly fleſhy, from the *Linea Aſpera*, immediately below the leſſer *Trochanter*, upon the outſide of the Bone, and is continu'd almoſt to the lower *Apophyſis* of the ſame Bone on the inſide, whence it deſcends obliquely almoſt ſemicircularly, and growing tendinous, at once joins and is inſerted with the former.

Crureus. Tab. xxv.

The *Crureus* ſo call'd from its ſituation on the Thigh, like the *Brachiæus* on the Arm, is the laſt of the *Extenſores.* It ariſes from the forepart of the Thigh-Bone, between the *Trochanters*, and runs down the whole length of the Bone, and joining its Tendon to the reſt, is inſerted together with them.

Action.

Theſe all ſerve to extend the Leg, and tho' from their ſeveral Originations they have different Names, may be as reaſonably accounted one Polyventer Muſcle, as many others of the Body are.

The Leg is mov'd obliquely inwards and outwards by three Muſcles.

Longus Tab.xxiii, xxv. That which draws inwards is call'd *Longus*, or *Sartorius*, from the uſe *Taylors*, who ſit croſs-legg'd, make of it. It is called likewiſe *Faſcialis*, from its running over the other Muſcles of the Leg and Thigh like a Swathe. It ariſes from the fore-part of the Spine of the *Os Ilium*, and deſcending obliquely inwards, runs over the *Rectus*, and *Vaſtus internus*, and part of the *Triceps*, and a little below the middle of the inſide of the Thigh meets with the *Gracilis*, from whence it runs tendinous over the inferior internal Head of the Thigh-Bone, under a covering of the *Faſcia lata*, and is inſerted about four Fingers breadth below the Head of the *Tibia*, on its inſide forwards. *Action.* It brings the Legs together and acroſs.

Poplitæus Tab.xxvii The *Poplitæus*, or *Subpoplitæus*, ariſes with a ſhort ſtrong Tendon from the external inferior Protuberance of the Thigh-Bone, and running obliquely croſs the Joynt, is inſerted broad into the upper part of the *Tibia*, on the inſide, a little below its upper *Apophyſis*. *Action.* It not only antagonizes the *Taylors* Muſcle, but aſſiſts the Benders likewiſe.

Membranoſus, *or* Faſcia lata. Tab.xxiv. The *Membranoſus*, or *Faſcia lata*, ariſes fleſhy from the fore-part of the Spine of the *Ilium*, but ſoon becomes membranous, and covers almoſt all the Muſcles of the Thigh and Leg down to the Foot, and in its Action turns the Leg outwards. *Action.*

Parts of the Foot. The Foot is divided into three Parts, the *Tarſus*, *Metatarſus*, and *Digiti* or Toes.

Tarſus. Tab. xxi. The *Tarſus* is that Space which is between the Ankle and the Body of the Foot, call'd *Metatarſus*, and anſwers to the Wriſt in the Hand. It conſiſts of ſeven Bones.

Talus. Ibid. The firſt is call'd *Talus*, or *Aſtragalus*, or *Os Baliſtæ*: This Bone has, as it were, ſix Sides or Faces. The upper Face of it is partly convex, partly concave, and cover'd with a Cartilage.

Its Head is receiv'd into the *Sinus*, at the lower end of the *Tibia*, and its Hollow receives the ſmall Protuberance of that Bone. The lateral Faces of it are in a manner plain, and are connected to the Proceſſes of the *Tibia* and *Fibula*, which make the Ankles. The fore-part is gibbous, and is receiv'd into a *Sinus* of the *Os Naviculare.* The hind-part is ſinuous, and receives part of the *Calcaneum*, or Bone of the Heel: On the under-ſide, on the hinder-part, it has a pretty large *Sinus*, which receives the upper and hinder-part of the *Calx*; and towards the fore-part of the ſame ſide it has a Protuberance, which is received into a *Sinus* of the ſame Bone; ſo that on both ſides this little Bone is articulated by a *Ginglymus*: On the upper, to the *Focile majus*, or *Tibia*; on the under, with the *Calcaneum*; and laterally *per Arthrodiam*, or ſlight Connexion.

Calx. Tab. xxii.

The next is the *Calx*, *Calcaneum*, *Calcar Pedis*, which is the biggeſt and thickeſt of all the Bones of the Foot. It lies under the *Aſtragalus*, to which it is articulated, as already deſcrib'd. On the hinder-part it has a large Protuberance, into which is inſerted the great Tendon of the *Gaſtrocnemii*, or *Chorda Achillis*. On the fore-part it has a Cavity which receives the *Os Cubiforme*; on the inſide it has a notable *Sinus*, through which runs the Arteries, Veins, and Nerves, with the Tendons that move the Foot inwards, and bend the Toes; and between that and the *Aſtragalus*, towards the *Metatarſus*, is a Cavity, in which lies a mucilaginous Gland, with Fat for the Lubrication of the Cartilages and Tendons.

Naviculare. Ibid.

The third is the *Naviculare*, or *Scaphoides*, which lies between the *Aſtragalus* and the *Oſſa Cuneiformia*. On the hinder-part it has a large *Sinus*, which receives the fore-head of the *Talus*;

and on its fore-part it is divided into three ſmall Heads, which are received into ſo many *Sinus* in the hinder-part of the cuneiforme Bones.

Oſſa Cuneiformia Tab. xxi. The *Oſſa Cuneiformia* are in Number three, and are generally by Authors call'd *Innominata*, but nam'd *Cuneiformia* by *Fallopius*, from their Figure, which is thick on the upper part, with a *Sinus* in each; on the under part thin. They are join'd as before-ſaid to the *Aſtragalus*, and at the fore-end to the Bones of the *Metatarſus*. They are of unequal bigneſs; that at the ſide of the great Toe being the biggeſt, that at the oppoſite ſide next in ſize, and the middle one leaſt: On the upper ſide they are convex, on the under a little concave, to favour the Tendons that lie under.

Cuboides. Tab. xxii. The laſt Bone of the *Tarſus* is the Cubiforme of a Figure irregularly cubical. It is rang'd along the *Cuneiformia*, on the ſide of the Foot: Behind, it is join'd to the *Os Calcis*; before, to the two outward Bones of the *Metatarſus*; and on the inſide to the third *Os Cuneiforme*.

Metarſus. Tab. xxi. The Bones of the *Metatarſus* are in number five; whereof the firſt, or innermoſt, which ſuſtains the great Toe, is much thicker than any of the reſt; that next to it is the longeſt; from which, to the outward, they grow gradually ſhorter. They are longer than the Bones of the *Metacarpus*, in other things they reſemble them, both as to Figure, and manner of Articulation. The firſt three are join'd to the Cuneiforme Bones, the other two to the *Cuboides*.

T A B. XXVII.

Divers Muſcles which appear after the external Muſcles, repreſented in the preceding Table, are taken off.

N. B. *The oppoſite Figure annex'd, (or* Out-line, *as 'tis call'd) having the Names of all the Parts written on it, 'tis needleſs to add any farther Explication of this Table.*

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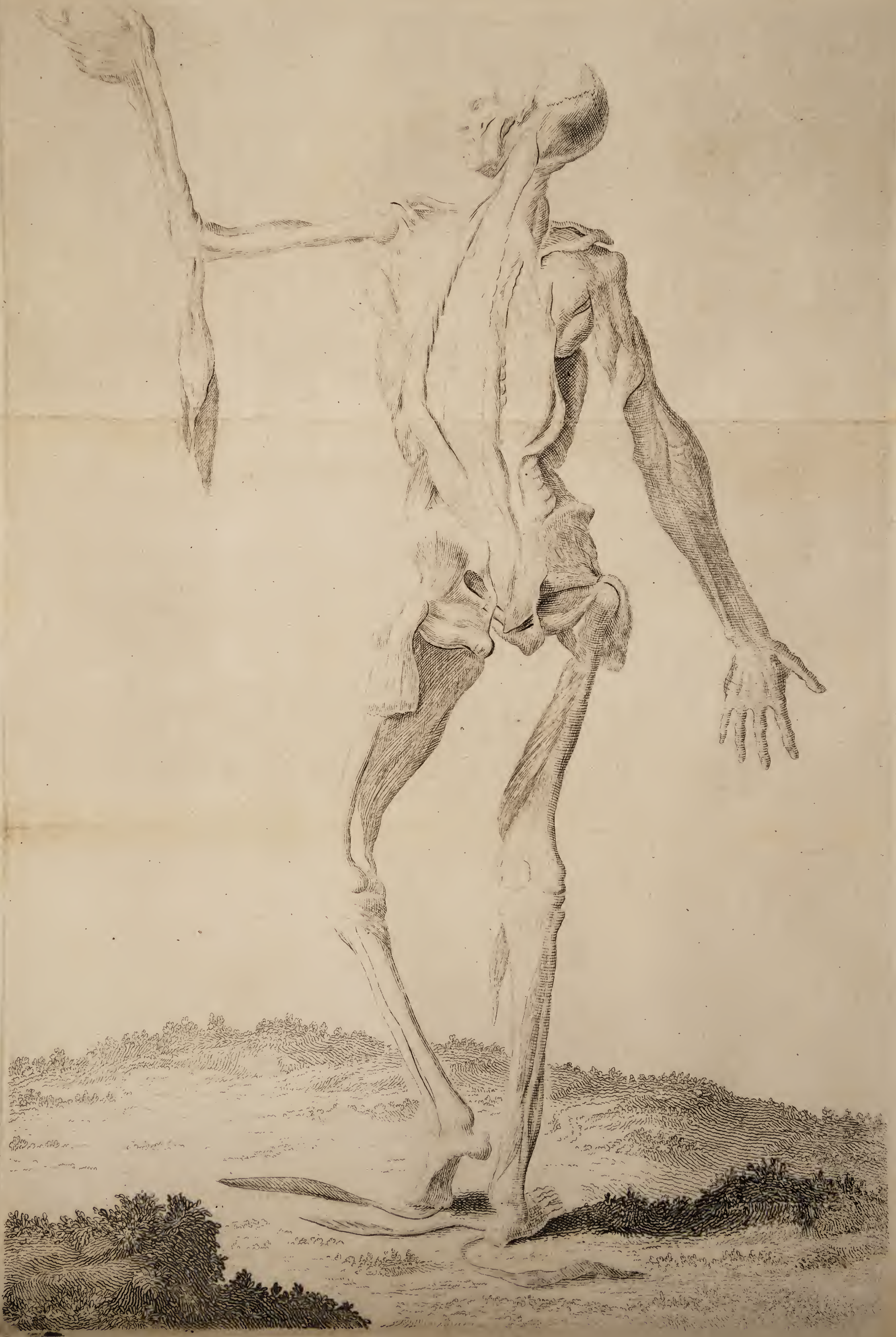
Tab. XXVII.



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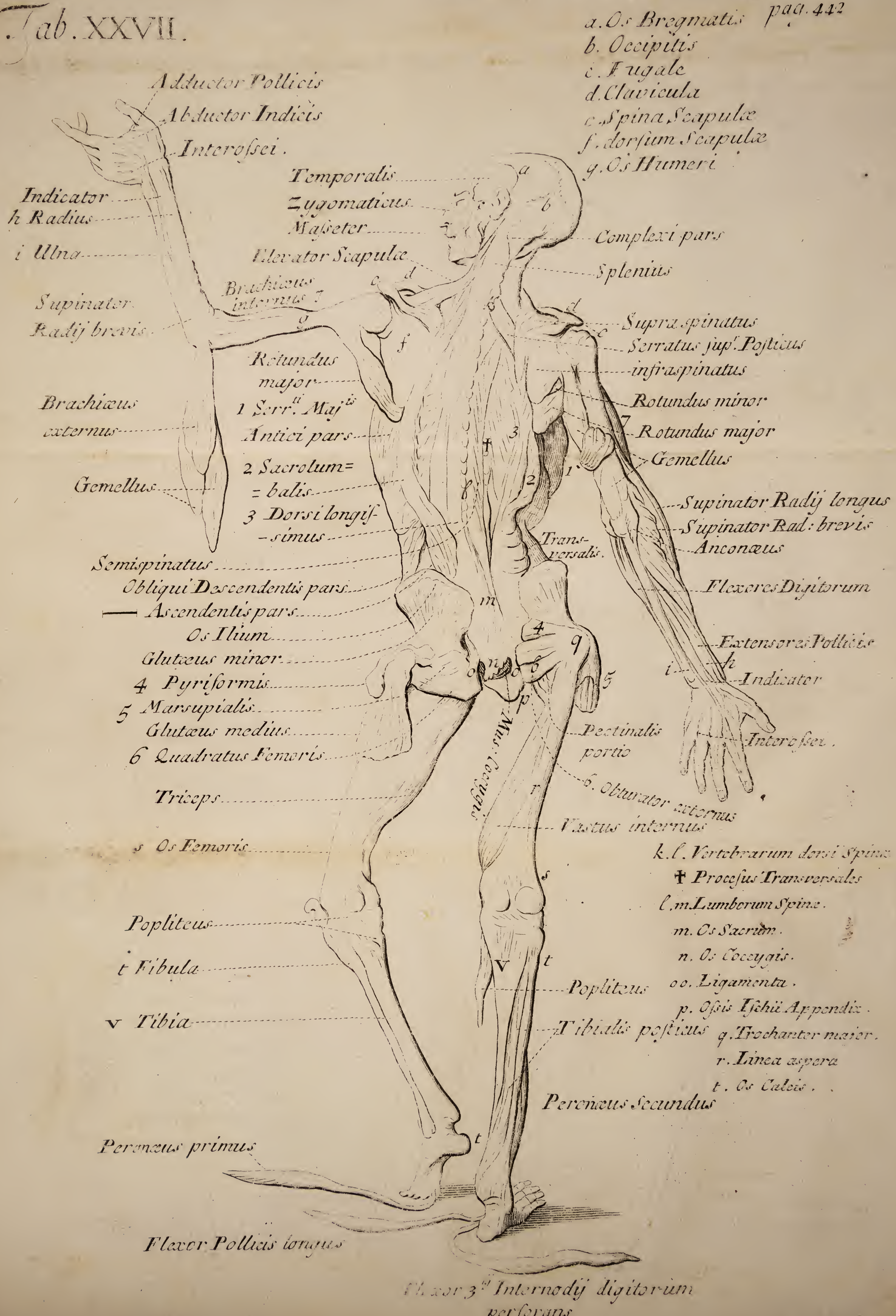

Bones of the Toes. Tab. xxi.

The Bones of the Toes are in number Fourteen; in every reſpect like thoſe of the Fingers, except that the *Pollex Pedis* conſiſts of but two Bones, and is ſo ſeated as to be longer than the other Toes, contrary to the Thumb, which is ſo plac'd as to appear ſhorter than the Fingers; and that the ſecond *Phalanx* of all the reſt of the Toes are extremely ſhort.

Seſamoidea.

There are twelve *Seſamoidea*, belonging to the Toes, and ſeated as in the Fingers.

Ligamentum Annulare. Tab. xxiv.

The Bones of the Feet are ty'd together by ſeveral Ligaments; the moſt conſiderable whereof, and which only we ſhall have occaſion often to mention by name in the Deſcription of the Muſcles of the Foot, is the *Ligamentum Annulare*; which in all reſpects ſo reſembles that of the *Carpus*, that it needs no other Deſcription.

Muſcles of the Tarſus & Metatarſus.

The Foot is extended by three Muſcles, or, according to ſome, by four.

Gaſtrocnemius externus. Tab. xxvi.

The firſt of theſe is the *Gaſtrocnemius*, or *Suralis externus* and *Gemellus*; which ariſes fleſhy with two Heads from both Proceſſes of the Thigh-Bone in the Ham, which joining together, conſtitute one great fleſhy Belly, which makes the outer part of the *Sura*, or Calf of the Leg, below which they become tendinous: Some divide this Muſcle into two, upon the ſcore of its two Heads; calling that which riſes from the outer Proceſs *Externus*, and the other *Internus*, retaining thereby the uſual Diviſion, yet multiplying the Number of the Muſcles.

Plantaris. App. Tab. xliv. Fig. vi.

The next is the *Plantaris*, which riſes fleſhy from the outer Tubercle of the lower *Epiphyſis* of the Thigh-Bone, and after letting down a little way a ſhort ſlender Belly, runs in a ſlender Tendon between the *Gaſtrocnemii*, marching along with their Tendon, and proceeding onwards to the bottom of the Foot over the *Os Calcis*, expands it ſelf under the *Soal*, upon the *Muſculus*

Perforatus, to which it adheres cloſely, as the *Palmaris* does in the Hand. Some reckon this among the Extenders of the Foot.

Gaſtrocnemius internus. Tab xxvi.

The *Gaſtrocnemius*, or *Suralis internus*, by ſome call'd *Soleus*, from its reſemblance in Shape to a Soal-Fiſh, ariſes fleſhy from the external Proceſs of the *Fibula*, and from the Back-part of the *Tibia*, and dilates itſelf into a large fleſhy Belly, which makes the inner part of the Calf of the Leg, under which it is gather'd into a ſtrong Tendon, and cloſely uniting with the Tendon of the *Suralis externus*, makes the great Tendon, or *Chorda Achillis*, which is inſerted into the *Calcaneum*, and is, as has been before obſerv'd, by much the greateſt and ſtrongeſt Tendon of the Body, whoſe Wounds are ſaid to be very dangerous. Theſe Muſcles extend the Foot, and by their extraordinary Strength enable the Feet to ſuſtain the weight of the whole Body, under which they would otherwiſe be apt to bend.

Vid. Phil. Tranſact. Vol. 21. No. 252.

The Muſcles which bend the Feet are two.

Tibialis Anticus. Tab. xxiii, xxiv.

The *Tibialis Anticus* ſprings from the exterior Proceſs of the *Tibia*, and becoming gradually broad and fleſhy about the middle of the *Tibia*, along the fore-part of which it runs, is contracted again into a ſlender ſmooth Tendon, which paſſes under the *Ligamentum Annulare*, and is partly inſerted to the *Os Cuneiforme majus*, and partly to the Bone of the *Metatarſus*, that ſupports the great Toe. This draws the Foot up.

Peronæus Anticus. Tab. xxiv.

Peronæus Anticus, *Longus* or *Primus*, begins tendinous, and fleſhy from the Head and upper half to the middle of the *Perone*, or *Fibula*, and running (as it were in a Pully) through the Channel on the hinder-part of the outer Ankle-bone, is inſerted into the upper end of the Bone of the *Metatarſus*, which joyns the great Toe.

This draws the Foot upwards.

Tibialis, or *Tibæus Poſticus* derives itſelf from both Bones of the *Tibia*, and from the Ligament that binds them together, and runs with a ſmooth ſtrong Tendon, through the *Sinus* on the inner *Malleolus* (as on a *Trochlea*) under the Annular Ligament to the inſide of the *Os Naviculare* : This is the *Adductor*, and draws the Foot inwards: From the uſe Sailors make of it in climbing it is ſometimes call'd *Nauticus*.

Tibialis poſticus, ſeu Nauticus. Tab. xxvii.

Peronæus Poſticus, or *Secundus*, call'd ſometimes *Semifibulæus* from a fleſhy ſharp Origin in the back part of the *Perone*, continues down the outer Ridge of the Bone, till a little below the middle, whence forming a ſmooth, ſtrong, flat Tendon, it runs through the ſame Channel at the bottom of the *Malleolus externus* with the *Longus* to the outſide of the *Os Metatarſi* of the little Toe.

Peronæus poſticus, ſeu Semifibularis. Tab. xxvii.

The Muſcles of the Toes reſemble thoſe of the Fingers ſo exactly in Number, Figure, Uſe and Name, that a bare enumeration with a reference to the Hand might ſuffice to give an Idea of them.

Muſcles of the four leſſer Toes.

Perforatus Sublimis, or *Flexor Brevis* ariſes from the inner and lower part of the *Calcaneum*, and ſends a Tendon to every Bone of the ſecond *Phalanx* of every one of the four leſſer Toes. In this (as in the *Perforatus* of the Fingers) there is a ſlit in each Tendon about the firſt Joint, which lets thro' the Tendon of the *Perforans*.

Perforatus. App. Tab. xliv. Fig. vi.

Which is call'd alſo *Flexor tertii Internodii Digitorum Pedis*, and *Flexor magnus*, and ſprings from the hinder part of the *Tibia* and *Fibula*, near their Juncture. It runs under the inner Ankle, and through the *Sinus* of the *Os Calcis*, where there is a fleſhy Maſs, which joyns it, whence ſome have not unreaſonably fixt one Origin of it here. It is divided into four Tendons, which runs thro' the ſlits in the *Perforatus* to the third *Phalanx* of the Toes.

Perforans ſeu Profundus. App. Tab. lxiv. Fig. vi.

The Extenders of the Toes are nam'd *Longus* and *Brevis.*

Extenſor Longus. Tab. xxiii xxiv, xxv.

The *Extenſor Longus* derives it ſelf from the fore-part of the upper *Epiphyſis* of the *Tibia*, near the *Fibula*, and growing tendinous about the middle of it, runs in four Tendons under the Annular Ligament, to the third Bone of every Toe, except the *Pollex.*

Extenſor Brevis. Tab. xxiv.

The *Extenſor Brevis* comes from the exterior and forepart of the *Calcaneum*, and goes to the ſecond Joint of the Toes.

Lumbricales. App. Tab. xliv. Fig. vii.

The *Lumbricales* are four, and ariſe (as in the Hand) one from each Tendon of the *Profundus.* They go to the inſide of each of the leſſer Toes.

Interoſſei. Ib. Fig. ix.

The *Interoſſei* of the *Metatarſus* in Number, Uſe, Figure, Origin and Inſertion, anſwer exactly thoſe of the ſame Name in the *Metacarpus.*

Abductor minimi Digiti. Tab. xxiv.

The *Abductor minimi Digiti* is a Muſcle proper to the little Toe only, ariſing from the outſide of the *Os Calcis*, near the exterior Bone of the *Metatarſus*, and is inſerted laterally into the outſide of the ſecond Bone of that Toe.

Tranſverſalis. App. Tab. xliv. Fig. viii.

The *Tranſverſalis Pedis* ſprings from the firſt Joint of the *Pollex*, near the *Os Seſamoideum*, and is inſerted into the Bone, that ſupports that next to the little Toe. It keeps the Toes together.

Muſculi Pollicis.

Moſt Anatomiſts allow but four Muſcles to the Thumb, but Mr. *Cowper* makes out ſix; aſſigning two Benders, and two Extenders; whereas others mention but one of each. But I chooſe to follow him who writes from *Autopſy*, and his own Inquiries. What therefore he has obſerv'd to appear conſtantly and regularly, I have no where ſcrupled to receive.

Extenſor Pollicis Longus. Tab. xxv.

The *Extenſor Pollicis Longus* riſes large and fleſhy, from the forepart of the *Fibula* from a little below its upper Proceſs, to within four Finger's breadth of the lower, whence paſſing under the *Ligamentum Annulare*, it is inſerted into the upper part of the ſecond Bone of the great Toe.

Exterſor Brevis. Tab. xxiii, xxiv, xxv.

The *Extenſor Brevis* ſprings fleſhy from the fore-part of the *Os Calcis*, and after a ſhort Belly, is contracted into a ſlender Tendon, which running obliquely over the upper part of the Foot, is inſerted into the ſecond Bone of the *Pollex*.

Flexor Pollicis Longus. App. Tab. xliv. Fig. vi.

The *Flexor Pollicis Longus* is deriv'd from the backpart of the *Fibula*, with a double order of Fibres, and runs tendinous under the inner Ankle, and thro' the Channel in the inner part of the Bone of the Heel, to its inſertion at the extremity of the great Toe on the Under-ſide.

Flexor Brevis. Tab. ib. Fig. viii.

The *Flexor Brevis* ariſes from the middle *Cuneiform* Bone. It is ſhort, thick and fleſhy, ſeemingly two, and running over the Termination of the *Peronæus*, has a double inſertion into the *Oſſa Seſamoidea*, which are themſelves faſtned to the ſecond Bone of the Toe.

Abductor Pollicis. Tab. xxiii, xxiv, xxv.

The *Abductor*, or *Thenar* ſprings from the inſide of the *Os Calcis*, and from the *Os Cuneiforme majus*, and is inſerted into the outſide of the exterior *Os Seſamoideum Pollicis*, and draws the great Toe from the reſt, which is at moſt but an obſcure, or ſmall Motion.

Adductor Pollicis. App. Tab. xliv. Fig. viii.

The *Adductor*, or *Antithenar* come from the third *Os Cuneiforme*, and is inſerted into the inſide of the inner *Os Seſamoideum* of the great Toe.

If in this Account of the Muſcles the Inquiſitive Reader falls ſhort of that Satisfaction, which he might propoſe to himſelf by a longer and more diſtinct Account; what is here wanting, will be amply ſupply'd by another Edition of Mr. *Cowper*'s *Myotomia Reformata*, which that indefatigably inquiſitive Anatomiſt, the Ornament of his Profeſſion, is now preparing for the Preſs; wherein in the curious Reader will not only be gratify'd with an exact Deſcription at large, but an elegant Figure of every Muſcle in a Human Body, either of which it was not to the purpoſe of this Work to give. However, ſhort as it is, I hope thoſe that ſhall begin their Study in Anatomy with this Book, ſhall not be miſled, nor the ſkilful Diſſecters find much to reprehend; which will ſatisfy the Writer, whoſe utmoſt Ambition it is to ſpend his Time harmleſly, and not altogether unprofitably, even to others. He is not ſo vain, as to hope to eſcape Cenſure; that is the Lot of much greater Perfections than he will ever pretend to: He expects it, even from thoſe who reap the Benefit of his Labours, which has been his Portion hitherto. But if the few Candid and Ingenuous accept his Attempt, he will think himſelf over-paid, and heartily wiſh well to thoſe that will do better.

A GENERAL

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